

FOUNDATIONS OF COLLEGE GEOGRAPHY

VOLUME II

INDIA

(An Economic and Regional Survey)

BY

M. NAZIR B. A. Hons. (LONDON), P.E.S.

Senior Lecturer in Geography,

Central Training College, Lahore.

AND

V. S. MATHUR M. A. (LONDON).

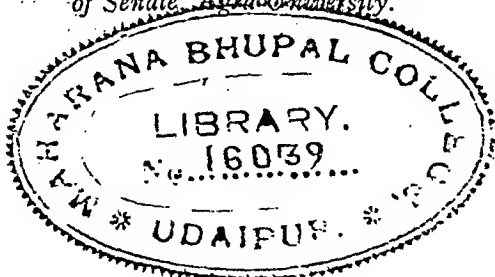
Lecturer in Geography, Govt. College, Lahore.,

Vice-President, Indian Geographical Society;

Formerly Lecturer, Teachers' Training

College, Ajmer; and Sometime Member

of Senate, Agra University.



1947

S. CHAND & Co.,

BOOKSELLERS & PUBLISHERS

DELHI

&

LAHORE

PREFACE

The complete publication of this volume has been considerably delayed due to some unforeseen and tragic events. The authors and the publishers regret the same.

Originally we had meant to have India and Asia in the one and the same volume, but their separation has now been necessitated owing to the changes in the syllabus brought about by the newly elected Board of Studies in Geography, Punjab University.

An attempt has been made in this volume to treat India in complete details, a venture which has never been attempted, we regret to add, by any Indian. We hope our attempt, howsoever incomplete and defective it may be, will be useful for those College students who had been greatly handicapped owing to the absence of a single complete work on India.

Most of the matter in this connection has been taken from books, official reports and journals of all kinds. It is well nigh impossible to name and adequately thank all the people and agencies from whose works we have freely drawn. Occasional acknowledgements occur, however, in the text.

Our special thanks are due to Dr. Rajnath of Benares, Dr. S. P. Chatterji of Calcutta, Dr. Pithawala of Bombay, and Prof. George Kuriyan of Madras for the valuable suggestions made and for giving us valuable information as to suitable references about some topics. Prof. Kuriyan's and Dr. Chatterji's works have been a great help in the preparation of this volume and for this we tender our thanks. On one occasion we also consulted Dr. R. D. Tewari of Khalsa College, Bombay and he very willingly solved our difficulties. Mr. G. C. Awasthy's *Tea Industry* has also proved useful. We must not forget to tender our gratitude to Dr. K. S. Ahmed and Dr. L. Dudley Stamp whose brilliant writings have been a constant source of help and inspiration to us during the preparation of this volume.

In presenting this book to teachers of geography in India *we beg to crave their indulgence for any mistakes in expression or facts which may kindly be pointed out to us. There are also some misprints, some of them quite silly.*

The printing and the get-up of the book are also not quite upto the mark, but the difficulties of a post-war era can hardly be exaggerated.

LAHORE.

M. NAZIR

V. S. MATHUR.

CONTENTS

CHAPTER	PAGE
I. Introduction	... 1
II. Relief and Drainage	... 4
III. Climate of India	... 13
IV. Natural Vegetation	... 24
V. Agriculture in India	... 28
VI. Livestock Wealth of India	... 61
VII. Irrigation in India	... 65
VIII. Power Resources	... 91
IX. Mineral Wealth	... 99
X. Industries	... 109
XI. Transport and Communications	... 139
XII. Trade (Internal and Foreign)	... 170
XIII. Population	196
Special Studies	
1. Natural Regions	219
2. Regional Controversies	233
3. Provincial Studies	240

BREAK AND RETREAT OF MONSOON



(Adapted from a similar map issued by the Meteorological Deptt.)

1. Bay Islands. 2. Lower Burma. 3. Upper Burma. 4. Assam. 5. Bengal.
6. Orrisa. 7. Chota Nagpur. 8. Bihar. 9. United Provinces-East. 10. United Provinces-West. 11. Punjab, East and North. 12. Punjab, South and West.
13. Kashmir. 14. N. W. Frontier Province. 15. Baluchistan. 16. Sind. 17. Rajputana-West. 18. Rajputana-East. 19. Gujrat. 20. Central India, West.
21. Central India, East. 22. Berar. 23. Central Provinces, West. 24. Central Provinces, East. 25. Kon Kan. 26. Bombay, Deccan. 27. Hyderabad, North.
28. Hyderabad, South. 29. Mysore. 30. Malabar. 31. Madras, South-East. 32. Madras, Deccan. 33. Madras Coast, North.

INDIA

WORLD POSITION OF INDIA

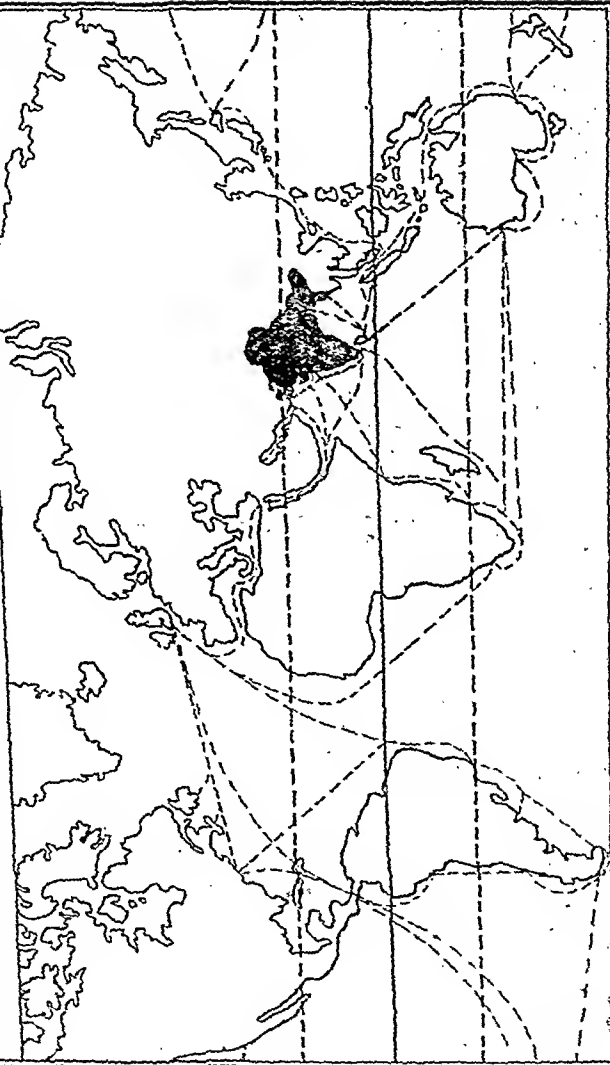


Fig. 1.

CHAPTER I

INTRODUCTION

India is a vast country—about 1·6 million square miles in area — occupying a southern position in the continent of Asia. Fig. 1 shows that India is entirely north of the equator extending from about 8° to about 37°N—her longitudinal extent being between 61° and 97° E

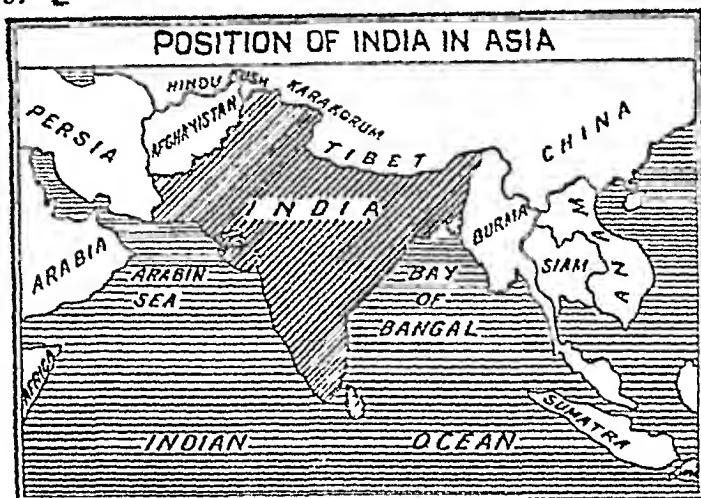


Fig. 2.

The northern system of mountains that isolates India from the rest of the continent of Asia is difficult to cross except through the

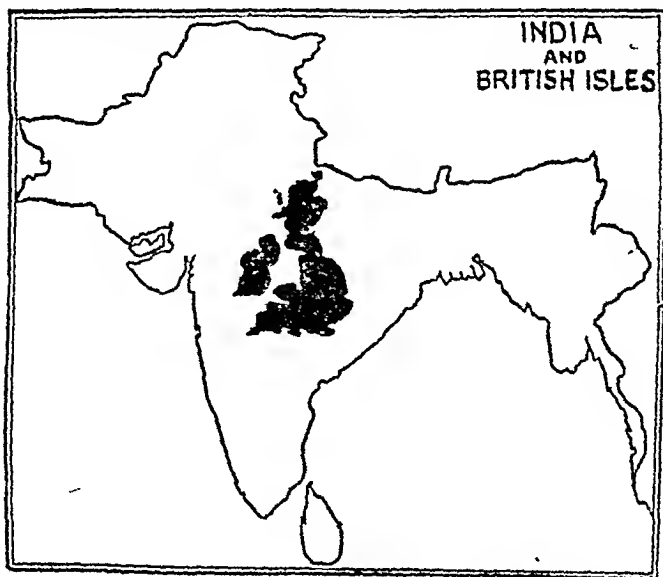


Fig. 3.

Khyber and Bolan passes in the north-west, a fact that is manifest from History. As we shall learn later on, these mountains also have a marked influence on the climate of the country.

India is a huge country so much so that many persons prefer to call it a sub-continent. Figures 3 and 4 give some idea of her size. Her area is equal to that of Europe excluding Russia—British Isles being only equal to some of the Indian provinces in area. The area of our country is about one sixth that of Africa,

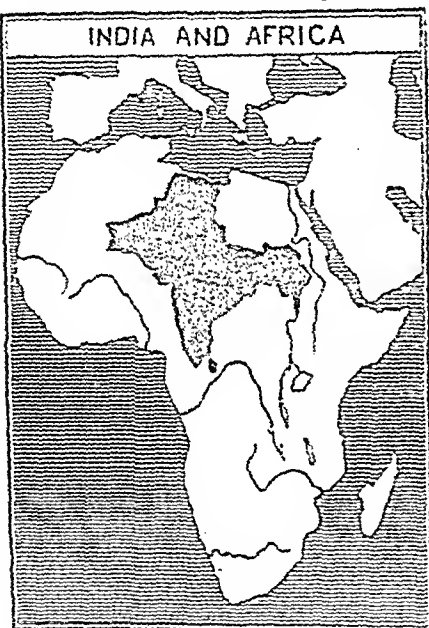


Fig. 4.

ports. A comparative study of the British and the Indian coasts does not speak very highly of India.

India contains a huge population within her boundaries, so much so that if all the people of the world were made to stand in a line, roughly one man in every five will be an Indian. Although India occupies only about 3·4 per cent of the area of the world, she claims about $\frac{1}{5}$ th of the entire world population. According to the 1931 census India was a close second to China in the matter of population, but the 1941 figures give her the first position.

India has a great variety of religions, languages and customs so much so that every region stands out as a separate entity quite different from the others.

A sub-continent. Are we justified in calling India a sub-continent? The answer is not difficult to give. India is a geographical

the second largest continent in the world. The size of an average Indian district is about 4,000 sq. miles and some of our bigger districts like Mymensingh (Bengal) and Vizagapatam (Madras) are larger in size than the European countries of Denmark, etc.

India is as much broad as she is long. Her greatest width from east to west is about 2,200 miles and her greatest length from north to south is about 2,000 miles.

The length of Indian coastline is only about 4,000 miles, a figure which is quite insignificant when compared to the size and magnitude of the country. The coasts of India are compact and straight, thus giving her only a very small number of good

unity and her boundaries both on land and sea are so well marked that she can be easily sorted out as a separate unit. Though she is a part of Asia, she has greater claims for being called a continent than Europe at least as far as physical boundaries are concerned. The high and almost impregnable wall of the Himalayas in the north and the broad expanse of deep ocean in the south are reasons enough to further our claims. Her climate, religions and culture show sharp differences with those of her neighbours—much more than the peoples of the various European countries.

The Political Divisions of India. Formerly Burma was also included in India as a province but it was separated by the Act of 1937 and now forms an independent part of the British Empire. The governor is appointed directly from London. Ceylon, in the south is an island colony and makes a part of the British colonial Empire. She is directly connected with the colonial office in London.

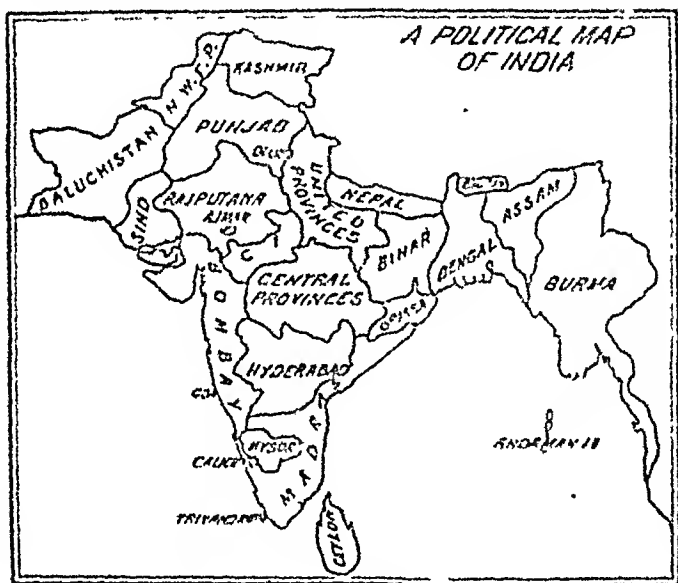


Fig. 5.

The supreme authority in India is the viceroy who assists the king and the cabinet. The viceroy and his ministers have Delhi as their winter capital and Simla as the summer capital. Some parts of India are ruled by native kings but they are finally under the Crown. India is divided into eleven provinces.

1. North-western Frontier Province. 2. The Punjab. 3. The Sind. 4. The United Provinces. 5. Bihar. 6. Orissa. 7. Bengal. 8. Assam. 9. Central Provinces. 10. Bombay Presidency. 11. Madras Presidency.

There is a Governor in each province. He has ministers to help him. The two legislative bodies frame laws. They contain members elected by the people.

CHAPTER II

RELIEF AND DRAINAGE

Geologically speaking, the Deccan or the Southern Peninsula of India is the oldest part of the country. Ever since the Cambrian period about 500 million years ago, the plateau has been a land area*. The rest of India in the north formed an arc of the big sea called the Tethys. The Himalayas and the other northern mountains are supposed to have been folded out from the marine deposits of that sea. The sea then receded to the west giving way to a combined estuary of the Indus, the Ganges and the Brahmaputra. The drainage from the newly-created Himalayas filled this estuary with debris which later on folded into the Siwaliks.

The upheaval of the Himalayas formed a depression in the north of the peninsula. The filling-up of this depression by the rivers has eventually given us the Indo-Gangetic Plain. The Indo-Gangetic-Brahmaputra system was later on split up into three different systems.

The coastal plains of the south are supposed to have been formed by the combined action of sedimentation and upheaval.

Such then is the brief geological history of India. Figure 6 shows the geological divisions of India. From what we have learnt it is quite easy to understand this division.

PHYSICAL DIVISIONS

India may conveniently be divided into four physical divisions. These are : (1) The great mountain wall of the north, (2) The northern plains of the Indus, the Ganges, and the Brahmaputra and their tributaries; (3) The great plateau of the south usually known as the Deccan and (4) the coastal plains surrounding the southern plateau.†

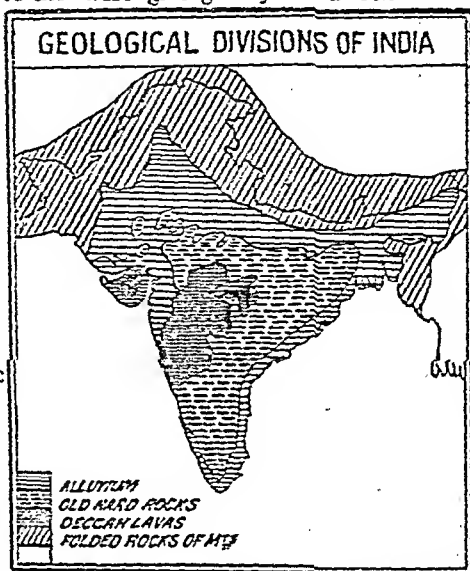


Fig. 6

*It is reported by geologists that the plateau was subject to considerable volcanic activity during the early geological ages. The presence of lava in some portions of the Deccan may, therefore, be readily concluded.

†The coastal plains are usually taken as a part of the Deccan tableland and as such there are only three divisions.

1. **The Northern Mountains:** The northern mountain wall, formed by the Himalayas and other ranges, curves like a scimitar across the north of India to make an almost complete rampart. As shown in Fig. 7, the Pamir Knot seems to be the central point from where all

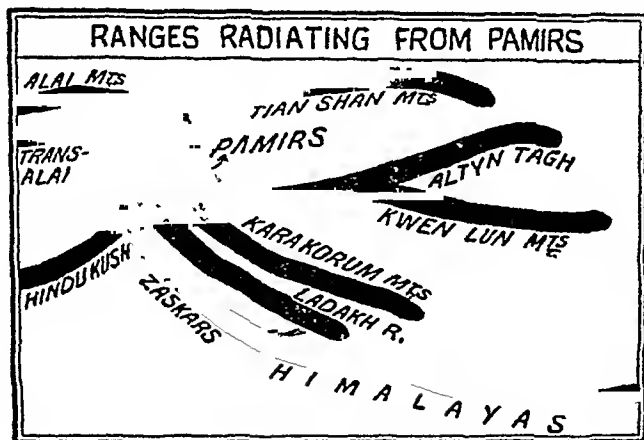


Fig. 7

the ranges radiate on all directions. The Himalayas are the highest and the loftiest system of young fold mountains in the world and they include gigantic peaks like the Mount Everest (29,141 feet), the Kinchinjunga (28,146 feet) and the Mount K2 or Godwin Austen (28,250 feet).

For a detailed study of the region, the northern Highlands may be sub-divided into (a) the Himalayas, (b) mountains of the north-west and (c) the eastern hills.

(a) The Himalayas are still to be explored and we know only little about their details. The Himalayas are a system of young fold mountains not subjected to much weathering. The ranges are either parallel or converging, intersected by valleys and plateaus. The average width of the Himalayas is between 150 and 200 miles. The ranges present a steep slope towards the plains of India in the south and a gentle one towards Tibet in the north. Because of their young geological age, the Himalayas are very lofty and have a total of about 140 peaks, the most important of which have already been mentioned. The valleys are mostly young V-shaped valleys.

The eastern Himalayas of Nepal and Sikkim rise very abruptly from the plains of Bengal and the snow-line is soon reached. Mount Everest and the Kinchinjunga are only a few miles away from the plains and are easily visible from there. But the western Himalayas of the Punjab and Western United Provinces rise very gradually. The average length of the Himalayas between the Brahmaputra and the Indus is about 1,500 miles.

The greater Himalayas or the innermost line of high ranges have an average height of about 20,000 ft. and over. The lesser Himalayas or the middle ranges are of lower elevation, nowhere more than

12,000 ft. to 15,000 ft. The outer Himalayas or the Siwalik ranges are merely a system of foothills with an average height of 3,000 to 4,000 feet.

Between the Siwaliks and the Himalayas there are a number of flat valleys known as the 'Doons'. They are covered with deposits of rock material brought down by the rivers. Here and there we may come across juttings of hill tops that have been buried under the silt.

Encircled within the great Himalayan ranges are two broad valleys* of Kashmir and Katmandu.—vast stretches of lowlands intermont from all sides and situated at a height of about 5,000 feet and above are the chief characteristics of these valleys. The origin of these peculiar valleys is attributed to the silting up of some big lakes. The Wuller lake and the Dals near Srinagar are reported to be the remnants of those bigger water bodies.

Glaciers. The Himalayan snow-line is more prominent on the southern slopes of the Himalayas. In the eastern portion of the Himalayas, it is reached at about 14,000 feet, while on the western side it occurs a bit higher at about 19,000 feet. On the opposite side of the Himalayas the snow-line is reached at about 3,000 feet owing to extreme dessication of land and very low humidity. In the greater Himalayas there are many glaciers fed by the snows of the higher regions. Some of these glaciers are amongst the largest in the world. Their normal size varies from 2 to 3 miles but some of them are reported to be even about 24 miles long. Some of them descend to about 9,000 feet during winter specially in Kashmir.

(b) The mountains of the north-west lie west of the river Indus and consist largely of a series of flanking ranges that mostly lie out of British India. They form the Indo-Afghan and the Indo-Baluchistan frontiers. Kara-Korum and the Hindu Kush are the dominating ranges of the region. Southwards they are continued by the Sulaiman and the Kirthar ranges. Near the Sulaimans lie the plains of Peshawar, Kohat, and Bannu. These intermont plains are about 1000 feet above the sea-level and resemble the Doons greatly. The Salt Range forms the innermost portion of this system.

These mountains are of simple fold composition. A number of streams cross them from the Afghanistan side and most of the routes follow these river valleys. The valleys usually run from north-east to south-west. Owing to the lack of rainfall, the hills are usually bereft of all vegetation and wind erosion is naturally marked.

(c) The Brahmaputra breaks the continuity of the Himalayas, and the Assam and Burma hills, which though geologically similar to the Himalayas, form a separate sub-division. These eastern hills are rather low and have no broad valleys worth mentioning. The Garo, Khasi, Jaintia and the Naga hills running almost east-west join the chain of the Burma, Lushai and the Arakan hills running north-south. The western slopes of these hills are steep

*These are not river valleys.

but they have gentler slopes on the other side. Some of these ranges are intersected by small plateaus like the plateau of Shillong in Assam. Some of these hills adopt funnel shapes in the south. Cherrapunji in one of these funnels receives perhaps the heaviest rainfall in the world.

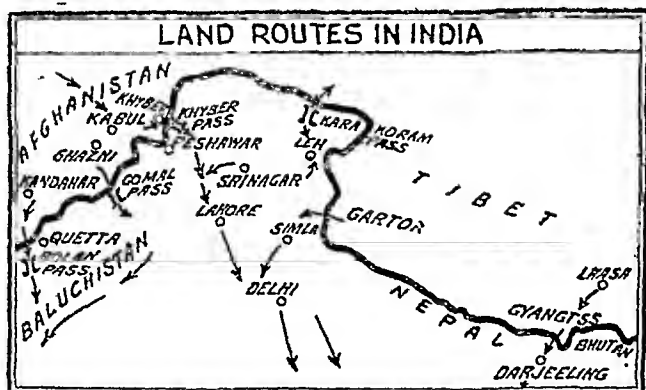


Fig. 8. (After Stembridge)

Land Routes. Because of the completeness of this northern mountain wall the few notable passes are of great economic and strategic importance and deserve some attention. Most of the passes are as much as 17,000 ft. and valley routes are difficult. In the north-west, on the Afghan frontier, the mountains are lower and the passes easier, it is from this direction that India has been invaded again and again. Here lies the most famous of all passes, the Khyber Pass. It is situated at a height of about 3,400 feet and leads from Peshawar to Kabul in Afghanistan along the valley of the river Kabul. The Bolan between the Sulaiman and the Kirthur ranges and the Gomul leading from the Punjab to Ghazni are also important passes in the north-west of India. In the Himalayas proper one route leads from Darjeeling to Lhasa into Tibet and another from Leh in Kashmir to Chinese Turkistan. Through an eastern offshoot of the Himalayas run a number of difficult routes to Burma, the most important being through Manipur state.

The **Tarai** is the name given to the 'no man's land' joining the northern mountains and the Indo-Gangetic plains. This is a very wet, unhealthy and undeveloped stretch of land composed of coarse sands and pebbles. Many streams flow as under currents during the dry season. The region abounds in swamps. Historians tell us that the region had a flourishing civilization in historic times. Diggings near Nepal have revealed relics of many medieval Buddhist cities.

2. **The Northern Plains** lie between the northern mountains and the Southern Peninsula. The average length of the area is about 2000 to 2,500 miles and the average width is about 200 miles, being greater in the west. These plains comprise of northern

Rajputana, the Punjab, portions of Sindh, U.P., Bihar, Bengal and the lower half of Assam.

It is a true, alluvial plain and claims two of the biggest deltas in the world, the delta of the Ganges and the delta of the Indus.

This is the most important part of India and it claims about two-thirds of India's population.

The region presents a flat appearance and even at a distance of a thousand miles from the sea, its height is only about 500 feet. It is only between the Jumna and the Sutlej that the land rises to about 900 feet and forms the water-parting between the two river systems i.e. the Indus and the Ganges.

The depth of the alluvium is reported to be considerable. Some borings have been made and it is estimated that the maximum depth may be about 6,500 and the minimum about 1000 feet. The land between the Rajmahal hills and Delhi is reported to have the deepest alluvium.

New alluvium or 'Khaddar' is found near the river banks, while the older alluvium or 'Bangar' lies away from the rivers and contains a good quantity of Kankar. The sub-soil level of the region is high.

3. The southern plateau is triangular in shape and is composed of old, hard, crystalline rocks. The northern boundaries are not well defined and are comprised roughly of the Vindhya (1,500' to 4,000') and other ranges running from east to west. The eastern side is known as the Eastern Ghats and comprises of broken ranges; and the western side is known as the Western Ghats and consists of a compact range unbroken except for three passes namely the Bhor Ghat, the Thal Ghat and the Pal Ghat Gap. These passes have been used for railway routes.

The Satpura line comprising of the ranges of Central India going down to Chotta Nagpur, has played a very important part in the history of India. It has acted as a barrier to the Aryans and others and it is only in this region that we find pure Indo-Dravidian blood.

The average height of the plateau is about 2,000 feet and it is divided into many plateaus of all sizes. Isolated hillocks are also found here and there, their number being the greatest near about the side hills.

The greatest height is reached in the south and west, and the general slope is towards the east.

The plateau mostly consists of metamorphic rocks. Slates and marbles occur in the north. In the north-west occur lava soils usually called *black cotton-soil*.

The Narbada rift-valley divides the peninsula into two sub-divisions almost triangular in shape—(a) The Malwa plateau in the north and (b) the Deccan. The Malwa plateau is largely broken up in the neighbourhood of rivers. The Deccan is characterised by flat-topped hills. The rivers of the Deccan flow in deep gorges. The

southern most portion of the plateau is called the Mysore plateau and descends abruptly towards the south.

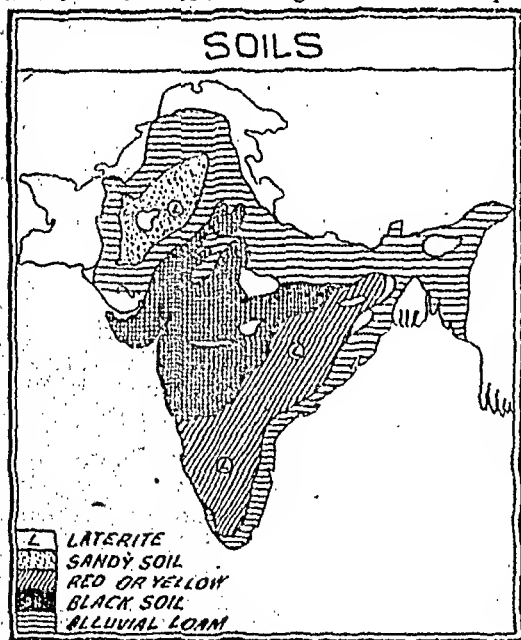
4. The South India plateau is flanked by coastal strips of lowlands on the west and on the east. The Nilgiri and the Cardamom hills physically separate these two strips of coastal plains. These plains are composed of alluvial soil and are agriculturally the most important areas of the south.

The eastern plains, also known as the Payan Ghats, may be easily divided into (a) the upper section consisting of plains lying in the upper courses of the rivers and (b) the lower portions consisting mostly of the deltas. The lower portions are entirely alluvial while the upper section may be partly called a peneplain covered at places by the alluvium of the rivers. Sand dunes are quite prominent near the seaward fringes of the plains. Some of these dunes enclose lagoons. Lakes Chilka and Pulicat are in fact lagoons of this type. The eastern coast claims some of the finest sea beaches in India.

The western coastal plain stretches along the Arabian Sea from the Nerbada valley down to the Malabar coast. This coastal strip is much narrower than the eastern one and claims no deltas worth the name. The plain is widest in the south and gets narrower towards the north. Along the southern half of the plains are situated a number of deep and navigable lagoons. The northern portion of this region forms part of a peneplain. Gujrat and Kathiawar are partly covered by black-cotton soil.

SOILS

The nature of soils plays a very important part in determining the nature and extent of agriculture in a particular area. Four main



types of soils have been recognised in India. These four types are: (1) the alluvial soils, (2) Black-cotton soil, (3) red soil and (4) the laterite soils. To these may be added the sandy soils of Rajputana. (Fig. 9).

(1) The alluvial soils of India very largely include the Indo-Gangetic alluvium along with that brought down by the Brahmaputra. Besides the northern plains of India, they are also found in the Surma valley in Assam and the south India valleys of the Godavari, Krishna and Cauvery. It is estimated that alluvial soils

Fig. 9.

cover an area of about 300,000 sq. miles in the country. The sands of Rajputana may also be taken as a modified form of the same. These alluvial soils of India are characterised by their ease of cultivation and rapid response to irrigation and manuring. In older alluvium away from the rivers, Kankar (or nodules) have been formed at a depth of a few feet below the surface. Another type of fine soil found alongside the Indo-Gangetic alluvium is loess or wind-laid soil found chiefly in the northern Punjab. This loess is very similar to that found in China and U. S. A.

2. The Black-Cotton Soil or *regur* overlies the Deccan Trap and covers an area of about 200,000 square miles—a large portion of Bombay, Deccan, the Malwa plateau, Central Provinces, Berar and parts of Hyderabad, Gujrat and Kathiawar. Some patches also occur in Tinnevely (Madras) and in Bundi and Tonk (Rajputana). The name Black Cotton Soil implies that this type of soil is specially suitable for the growing of cotton.

The black colour of these soils is partly attributed to the presence of accumulated humus. They have a tendency to become very adhesive when wet and moisture is retained for a long time thus making irrigation practically unnecessary. They are highly fertile and are believed to have been under cultivation for more than 2,000 years.

3. The red and slightly yellowish soils are common in the Madras Presidency, Orissa, the Garo and Khasi hills in Assam, eastern Bundelkhand, in U. P. and in southern Rajputana. They have been derived from ancient crystalline and metamorphic rocks and are believed to be of sedimentary formation. The chief type of red soil is a sandy clay.

4. The laterites (or lateritic soils) have a good proportion of white clay and have tints of brown, red and yellow. Agriculturally laterites are poor but proper manuring and tillage may improve them. These soils predominate on the summits of plateaus and hills of South India (Deccan, Central India, Central Provinces, the Eastern Ghats, South Canara, Bombay Presidency, and Malabar) and Assam.

DRAINAGE

The rivers of India play a very important part in the agricultural economy of the country. Long before the modern amenities of transport were available, rivers formed the chief aquatic roads. In the case of war, they were sound securities against foreign invasion.

The courses of the Indian rivers are believed to have undergone great alterations, the most important being the deviation of the river Jumna, which used to flow in a south westerly direction through eastern Punjab and Rajputana. The Indus, the Ganges and the Jumna once formed one system.

The rivers of India may be broadly divided into two main groups :—(1) those rising in the Himalayas or beyond and (2) those

rising amongst the hills of the plateau. The northern rivers are fed by mountain snows and a minimum supply of water is always assured, and this minimum supply can be easily gauged and used for irrigation. The southern rivers that rise amongst the hills of the plateau are dependent on monsoon rainfall so that during the off monsoon months, most of them become almost waterless.

1. The rivers of the north fall into two main systems :—(a) the Indus and its tributaries and (b) the Ganges and its tributaries. The river 'Brahmaputra'* though longer than the Ganges, joins it just near its delta and is virtually an important tributary of the latter.

(a) The Indus (1,800 miles) rises in Kailash at a height of about 17,000 feet. After about 200 miles, it crosses into Kashmir and flows on steadily via Leh receiving the waters of Zaskar, Shyok, and Gilgit. Near Chilas the Indus finally turns to the south. Shortly it leaves Kashmir and enters British India and forms the boundary between the districts of Peshawar and Hazara in North-West Frontier Province. Further down is Ohind where Alexander crossed the river. Just below the junction of the Kabul river is a more important passage at Attock. When it passes the western extremity of the Salt Range, the river spreads out into a wide lake-like expanse of water. In the Muzaffargarh district of the Punjab, it receives the Panjnad which brings to it the whole tribute of the five rivers of the Punjab viz., the Jhelum, Chenab, Ravi, Beas and the Sutlej (900 miles). From the west the Indus receives the Kurram. Below Kalabagh the river is a typical plain stream of great size so much so that opposite Dera Ismail Khan the valley is seventeen miles across. At Sukkur in Sindh a dam by the name of Lloyd Barrage, has been constructed for the purposes of irrigation. Near Hyderabad the delta stage is reached and the river is split up into a number of channels which all flow down into the Arabian Sea.

(b) The Ganges (1,550 miles) has its source at Gaimukh in Tehri State (about 30°N and 79°E.) It pierces through the mountains under the name Bhagirathi. Subsequently the Alakanda joins the Bhagirathi and the joint river is then called the Ganges. At Hardwar it enters the plains and then flows south and south-east. It is tapped at Hardwar by the Upper Ganges Canal and at Narora by the lower Ganges Canal. At Allahabad its most important tributary the Jumna joins it. In the district of Farrukhabad, the Ram Ganga joins the Ganges on the right bank. A little below Bhagalpur in Bengal, the delta stage is reached and the Ganges breaks up into a number of branches most important of which are the Hoogly and the Padma.

Amongst the tributaries the Gumti, Gagra and Gandak in the north and the Son in the south are also worth mentioning.

The continued importance of the river as a source of fertility and water to the fields and as a means of transport, has given it

*Known as the Tsangpo through its long Tibetan course.

the name and the rank of a goddess. Dying persons are taken to its banks to expire and corpses are cremated on its banks with the firm belief that the departed soul will attain eternal bliss. A dip in the Ganges is a very sacred undertaking. —

The Brahmaputra (1,680 miles) is technically a tributary of the Ganges. It rises beyond the Himalayas near Mansrower lake and flows through Tibet under the name of Tsangpo. Near the eastern edge of the Himalayas the Brahmaputra enters India and flows South until it joins the Padma—a branch of the Ganges.

2. The rivers of the south, as has been remarked before, form quite a different category. Of these rivers, the most important are (a) the Nerbda and the Tapti that are in the extreme north and flow east to west and empty into the Arabian Sea. Because of the swift speed and narrow coastal plains, the rivers only form estuaries — and (b) the Mahanuddy (520 miles), the Godavery (800 miles) the Kristna (800 miles) and the Cauvery (472 miles), that rise in the western hills and flow eastward into the Bay of Bengal. They make quite big deltas. The two small rivers of the south, the Vaigai and the Penner also flow eastward into the Bay of Bengal.

APPENDIX

Earthquakes. Earthquakes are more frequent in the regions of 'marked instability' i. e., in areas where earth movements like folding

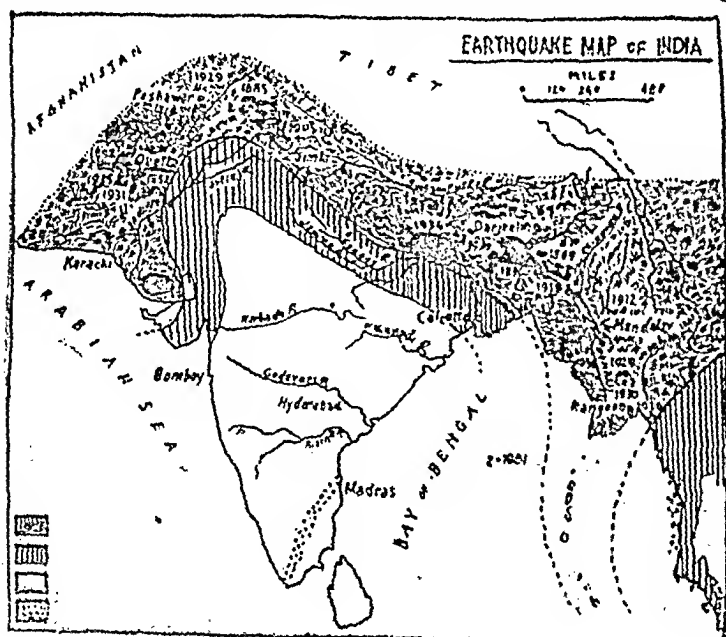


Fig. 10. (After west.)

and faulting are continuing. The Himalayan region is perhaps the most unstable region in the country and that is why nearly all earthquakes of major intensity occur round about there. The serious earthquake in Bihar (1934) is attributed to faulting in and around that region. The more recent earthquake of Quetta (1935) is attributed to the folding movement going on in the bending hills around. The intensity both in frequency and seriousness of earthquakes decreases as we move southwards.

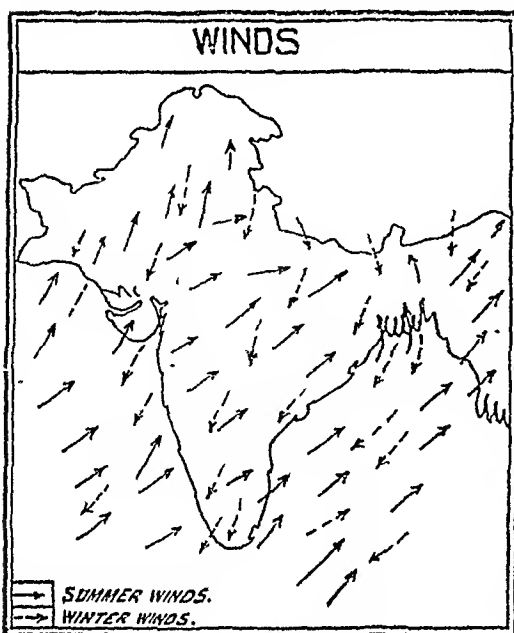
The Indo-Gangetic alluvial tract is an area of 'comparative intensity' and tremors are quite occasional. The peninsular block is a zone of feeble seismicity. It, however, has slight sympathetic tremors when severe earthquakes occur in northern India.

Volcanoes. Volcanic activity is of minor importance in the country now although geologists tell us that "Tertiary vulcanism" has been fairly widespread in the Himalayas, Burma and Baluchistan*. Some minor activity is found in Barren Islands and in Baluchistan†. Some Mud volcanoes occur in the Arakan Yomas and in the Mekran coast of Baluchistan. Owing to the dryness, the cones here attain much greater heights than in the east.

CHAPTER III.

CLIMATE OF INDIA

As a whole India has a climatic unity and is essentially tropical in her climatic essentials inspite of the fact that the Tropic of



Cancer divides her into two parts. Yet within her natural boundaries the country presents a greater variety of climatic conditions than found in any other area of similar size and importance. The contrasts are really surprising. Taking temperature for instance, there are places in the northern area where as low as -50°F have been recorded; on the other hand Jacobabad in Sindh occasionally reaches 125°F and above. Rainfall varies from 460" at Cherrapunji in Assam to 3" or less in upper Sindh. Contrasts in the daily ranges of temperature, humidity and pressure are equally striking.

Fig. 11.

*Krishnan—Geology of India and Burma p. 35.

†Narcondam in the Burmese arc is also reported to have some,

India furnishes a striking large-scale example of the changing of seasons known as 'Monsoons'—a phenomenon which is due to a number of causes, the outstanding of which is "the difference of temperature in the winter and summer months respectively between southern Asia on the one hand and the Indian ocean and China seas on the other.* This difference in temperature brings about a marked change of pressure conditions in this region. The summer monsoon is the south-west winds come from the sea and carry rainfall to all the parts of India while the winter or the north-east and north winds are of continental origin and are thus associated with great dryness except when they pass over a stretch of ocean.

The seasons have been grouped thus —

1. Season of the North-East and North Monsoons :—

(a) Cold weather season—December to February.

(b) Warm Weather season—March to June.

2. Season of the South-West Monsoon :—

(a) General rains—June to September.

(b) Season of retreating Monsoons—October to December.

COLD WEATHER SEASON.

During this period there is a general decrease of temperature

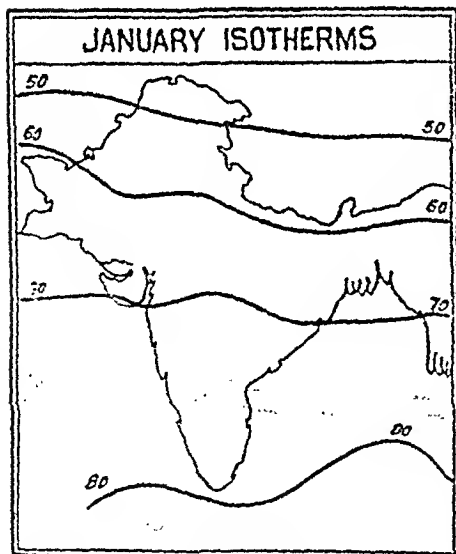


Fig. 12.

ably with July temperatures in Europe.

A high pressure area of great intensity covers the land mass of

all over, but naturally the temperatures in the north are much lower as is clear from the following table showing winter temperatures of some places.

Peshawar	... 50°F
N. Punjab	... 55°F
Benares	... 60°F
Madras	... 75°F
Calicut	... 78°F
Colombo	... 70°F

The winter isotherms are free from any irregularities and have regular east to west tracks. The decrease in temperatures is, however more sudden and more marked in highlands where the winter snowline is soon reached. The January temperatures in India compare favour-

NOVEMBER AND DECEMBER



Fig. 13. Rainfall

central and south-eastern Asia and has its centre somewhere near Lake Baikal. A secondary system of similar intensity covers north-western India and Kashmir—having a slight but a fair continuous southward gradient thus giving north-west, north and north-east winds moving towards a low-pressure region situated south. These winds are not very intense and their speed varies from about 3 to 5 miles an hour. These winds being of continental origin, there is practically no winter rainfall in the country; only the small portion of the Madras coast gets rainfall during these months. North-west India* fortunately receives during the winter months enough rainfall

JANUARY TO FEBRUARY



Fig. 14. Rainfall

to maintain such winter crops as wheat and Barley. This rainfall is, however, cyclonic in character and these cyclones (western disturbances) are thought to come from the Mediterranean Sea via the Iran plateau. They are, however, of low intensity and fail to reach the Ganges.

HOT WEATHER SEASON

In March the temperatures begin to rise all over specially in the interiors and the atmospheric pressure diminishes. The wind is still north over the plains but sea-breezes get more prominent on the sea coasts. They bring some rainfall to the Malabar coast and the

*More specially in the Punjab.

Ganges delta but owing to their feebleness the rest of India remains unaffected. The heated air ascends but there is no rainfall, as the relative humidity is low. A great low pressure area is created over the Thar desert and the adjoining lands. In May, which is perhaps the hottest month, the isotherms assume shapes of concentric circles. The greater part of India has an average temperature of 85°F to 95°F . At many places even 105°F is reached. The daily range specially in the North-West is quite large. General humidity is very low—1 p. c. to 3 p. c.

The hot-weather season is usually associated with dust storms that come from the west. The storms are strongest in the north-west and there visibility is usually quite poor. Hailstorms are often caused by the cool north and north-west breezes, more specially in Bengal and Assam.

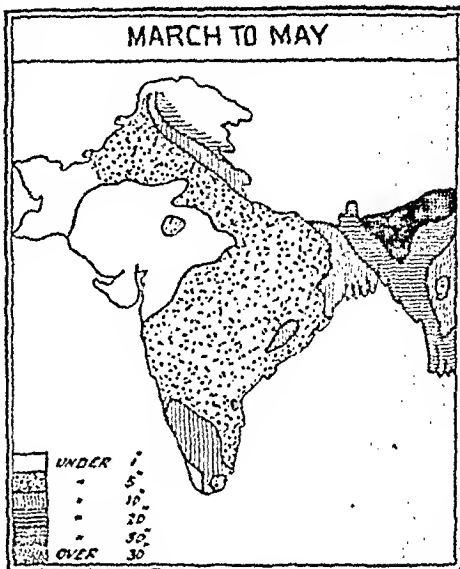


Fig. 15. Rainfall

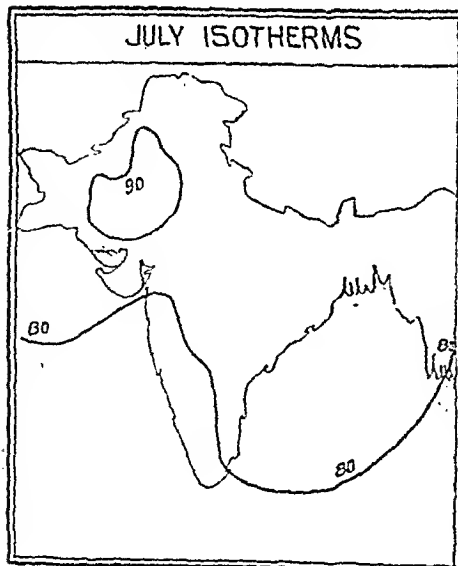


Fig. 16,

GENERAL RAINS

By the end of May the 'Hot-weather' conditions are intensified and there is a definite low pressure area over North-West India. The air circulation gets more and more vigorous. The south-east Trades (that become south-west after crossing the equator) are abruptly pulled up and they become a part of the Indian wind circula-

tion. These South-West Monsoons carry large amounts of water vapour and give about 90 per cent of the total rainfall to India. The setting in of the monsoon is usually referred to as 'bursting' and it is characterised by heavy downpour of rain accompanied by violent thunder and lightening. Temperatures fall sharply.

The following figures show the average decrease in temperature at this time :—

Peshawar	4°F	Patna	7°F
Lahore	7°F	Calcutta	4°F
Delhi	8°F	Bombay	4°F
Ajmer	8°F	Bangalore	7°F

• The south-west monsoon blows over the entire land mass as a fairly steady wind and its speed is about 6 to 8 miles per hour. At the eastern coast its speed is as high as 14 to 20 miles per hour but it slackens considerably as it goes into the interior. The actual direction and the velocity of the winds depend on the topography. The Deccan divides the monsoon into two branches i. e., the Arabian Sea branch and the Bay of Bengal branch, the latter reaches the land later but it gives rainfall to a much larger area. The former is much

more powerful but the Western Ghats that meet it as soon as it reaches land, deprive it of much of its vapour and energy. Certain currents of this branch reach the interior through the Narbada gap and join the Bay of Bengal branch in Chhotta Nagpur.

The map in the Frontispiece shows the direction of these winds and their arrival at different places in the country. By about the end of June the entire country is under monsoonic influence. The following table gives the normal dates of monsoon commencement in the various parts of the country.

Malabar	3rd June	Deccan	7th June
Bombay	5th June	Bihar	17th June
East-U. P.	20th June.	West U. P.	25th June
C. P.	10th June	Western Punjab	25th June
C. I.	15th June	Eastern Punjab	30th June

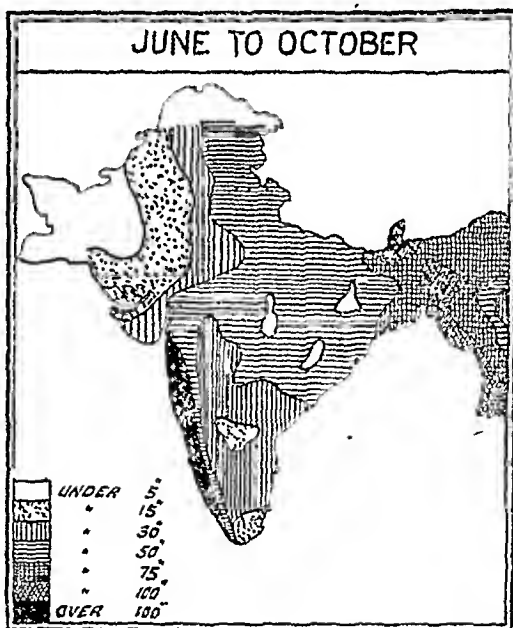


Fig. 17. Rainfall

Rajputana	15th June	N. W. F. P.	25th June
Bengal	15th June		

The eastern hills and the Himalayas deflect the S. W. winds to the west. July and August are the months of general heavy rains in the country and by about the 2nd week of September, rainfall begins to diminish. The local distribution of rainfall, however, depends largely on the topography of land and on the direction of ranges in relation to the wind direction. As shown in the relevant map (Fig. 17) the general rainfall distribution may be like this.

The northern plains show a westward decrease,* the highest rainfall being in the eastern hills. The averages are :—

Assam and E. Bengal—Over 80".

Western Bengal, Bihar and Eastern U. P.—40" to 80".

Western U. P. and Eastern Punjab—20" to 40".

Western Punjab, N. W. F. P., Sind and Rajputana—below 20".

The places near the mountains *e.g.*, the Tarai get higher rainfall.

In the Indus Valley there is a south to north increase—the highest being in northern and north-eastern Punjab.

In peninsular India, the highest rainfall is recorded in the western coastal plains and on the western slopes of the Western Ghats but beyond the Ghats, there is an abrupt decrease, the area being in the rain shadow.

More than 80 per cent of the total Indian rainfall takes place in this period. There is really little difference in the map showing the annual rainfall of India and the one showing the precipitation during the season of general rains.

The relative humidity during this period is naturally high. Temperatures are decreasing gradually after that sudden 'jump down' and pressures go on rising steadily. By about the beginning of September the monsoon currents gradually lose their power but this weakening is a gradual process. The map in the frontispiece gives the withdrawing of the monsoon. The 'retreat of monsoon' is characterised by cyclones, and storms usually of a local character.

SEASON OF RETREATING MONSOON

This is a period of transition. In October the monsoon ceases to blow and the whole of India experiences a sultry, uncomfortable weather. Such conditions, in some degree, last till about the middle of December. The Bay of Bengal branch retreats down the Ganges

*The following table illustrates very clearly the east to west decrease in rainfall in Northern India :—

Cheerapunji	430"	Delhi	27.6"
Calcutta	65.6"	Lahore	21.9"
Patna	42.8"	Peahawar	13.5"
Allahabad	37.6"	Jacobabad	3"
Agra	26.2"		

Plain. The Arabian Sea branch retreats down the Indus Plain in a similar manner. The low pressure system shifts to the south in the centre of the Bay and thence further south. A similar low pressure area is situated in the Arabian Sea. This period is associated with very low rainfall in the country. But the southern coast of Madras and some other eastern areas adjoining to it get sufficient quantities. In the coastal regions already mentioned, October and November are the rainiest months. Cyclones that develop in the Bay of Bengal also give rainfall to these regions. (Fig. 13)

With the retreat of the south-west monsoon, the sky clears and the days become bright and sunny again. Temperatures fall rapidly ; the minimum is reached sometime in December. North, north-east and north-west are the prevailing winds in the country. Cyclones of Mediterranean origin sometimes disturb the continuity of these conditions in the north-west and give some rainfall*.

ECONOMICS OF THE INDIAN RAINFALL

If we take the whole of India, there is only a small portion of

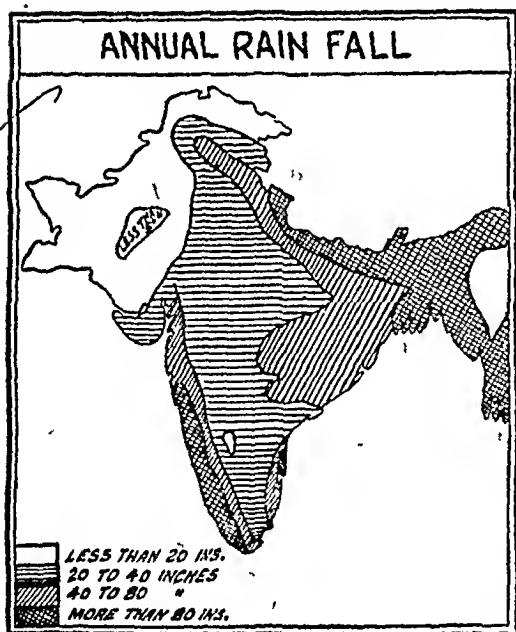


Fig. 18

the country that gets below 20" of rainfall during the year. The Indian average is 42" per year. But as actual facts stand such general statements and averages are of little use. The unavoidable facts remain that the rainfall is very unevenly distributed throughout the country and that it is limited to a period of three months in a year. Other points to be taken into consideration are that it is liable, (a) to fail partly or totally, (b) to arrive late or (c) to cease much earlier than usual—all cases are equally harmful. The chief characteristics are fully described below.

1. About 90 per cent of the total rainfall comes between mid-June to mid-Sept. Double-cropping is, therefore, possible with the help of irrigation only.
2. The monsoon may arrive late in the whole country or in any

*It is interesting to note that some part of India is always receiving rainfall.

part thereof. This is more frequent in north-west India. The delay may be anything from one week to a month.

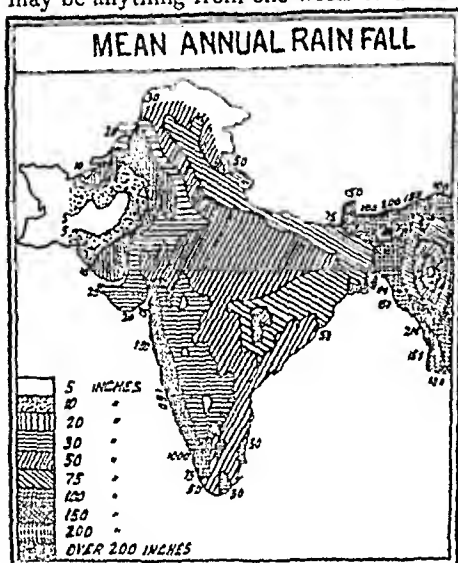


Fig. 19.

from some other region, both conditions being harmful.

6. The Indian rainfall usually falls in a heavy downpour thus leading to a tremendous run off. Extensive soil erosion and soil leaching result. The number of rainy days in India is comparatively very small, e.g., Bombay gets its 72" in 75 days while London gets its 29" in 161 days. The following table shows the number of rainy days at some places.

Madras	55 in a year
Ajmer	45 "
Jhansi	53 "
Lahore	37 "
Bombay	75 "
Calcutta	118 "

3. The monsoon may terminate much earlier than usual. The economic effects of this are quite serious as the crops may dry up or fail partially*. This factor is not very marked on the coasts.

4. There may be prolonged breaks lasting over the greater part or the whole of either July or August. These breaks are more frequent in north-west and western India. The greatest break noticed was in 1883 in north-west and central India, lasting for about six weeks.

5. The rainfall may persist more than usual in one part and desist

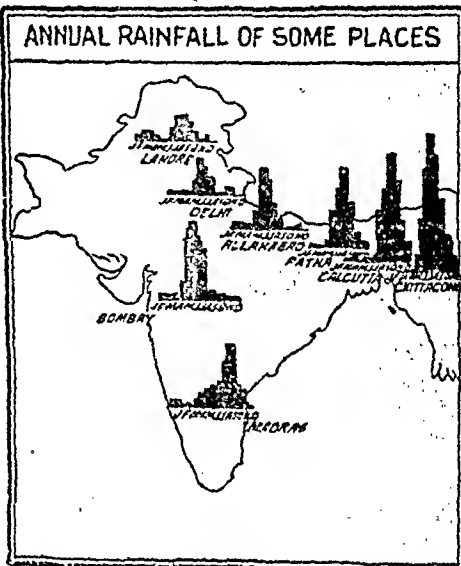


Fig. 20.

*In 1896 for instance the rainfall in Central India stopped six weeks earlier.

7. The variability of rainfall in India is very marked and widespread. Variability decreases with an increase in rainfall. The variability for a shorter period is greater. The map (Fig. 21) shows

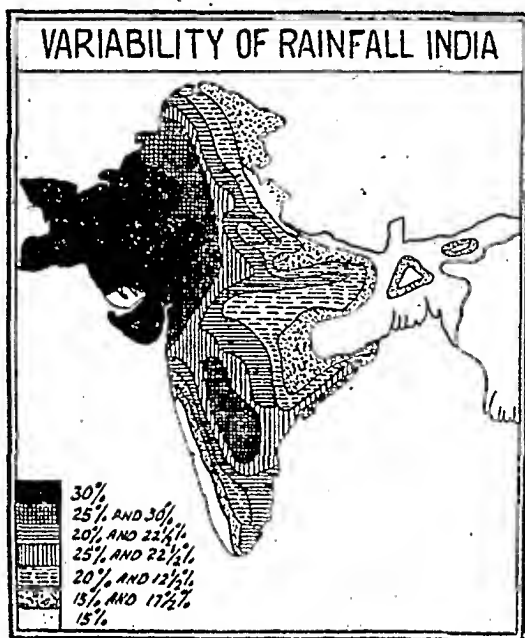


Fig. 21

the variability of rainfall in India as calculated by Prof. Williamson and Mr. Clarke of the University of Leeds. For the sake of comparison, variabilities for some foreign places are given below.

British Islands	= ± 11.
Central and Western Europe	= ± 13.
California	= ± 26.
Moram	= ± 14.
Rome	= ± 19.

RAINFALL REGIONS OF INDIA

A detailed division of the country into rainfall regions is at once necessary and useful. Prof. Williamson and Mr. Clarke brought out a scheme in 1931 and this has not yet been replaced. They divide India into 13 broad rainfall zones which have been summarized below:—

1. **Deserts.** They include Sindh, South-West Punjab (as far north as 500 ft. contour line) and also a portion of western Rajputana. Rainfall increases from a minimum in upper Sindh towards the Himalayas and the Aravallis respectively. But the average never exceeds 10". The aggregate variability is higher than 30 p. c. and even passes the 50 p. c. limit in the most arid parts.

Agriculture is only possible in some favourable spots with the help of irrigation.

2. **The Transitional Zone.** Surrounding the above in the north-east and south-east is a region having essentially transitional character. It stretches across the Punjab reaching to about 70 miles of the outer Himalayas. Further east where it swings southwards it approaches about 30 miles of Delhi and the Jumna. Between the desert and the Aravallis it is limited to a narrow zone which, however, widens out towards coastal areas. The annual precipitation may be between 15" and 20". The variability is also high.

3. This zone includes the sub-Himalayan Punjab and the upper and central sections of the Gangetic Plains. The annual rainfall varies from 20" to 50" increasing towards the north and the east. It is, however, important to bear in mind that the fluctuations of the Rabi rainfall are twice as great as those of the Kharif precipitation—15 to 20 p. c. in summer and 40 p. c. in winter.

4. This comprises the eastern sub-Himalayan tract in the north of Bihar, together with the western part of the Gangetic delta and the lowland fringing the uplands of Bihar and Orissa including those of the lower Mahanadi Basin. The rainfall is between 50 to 75 inches with the minimum in the areas adjoining No. 3 and also east of the Rajmahal foot-hills. There is marked precipitation in spring months usually increasing through the year to a single maximum in summer. Variability is very low—10 to 15 p. c.

5. Eastern Bengal and the Assam valley form a region of heavy rainfall—the rainy period is also much longer. Variability is between 5 and 10 p. c.

6. The west coast region of Peninsular India proper, like No. 5, is a region of very heavy rainfall—75" to 100". The variability is equally low.

7. Gujrat with Kathiawar, north of the west coast region forms the better endowed of the transitional zones between it and the desert region. Here the annual rainfall ranges from 20" to 50" and the July maximum appears to predominate more than anywhere else in India with over 40 per cent. of the annual precipitation. The period of rain is most restricted north of the gulf of Cambay where the monsoon rains cease in September.

8. The greater part of the Deccan has an annual rainfall ranging from 50 inches down to even less than 20 inches. The rainfall is on the whole very uncertain. The amount dwindles rapidly eastwards from the ghats and is lowest in the great central block which is also more fickle, although the area with the actual minimum lies towards the east, the rainy period extends over a larger period of the year and the centre of high variability does not coincide with the seat of the least rainfall.

9. This region covers that part of India which derives most benefit from the retreating monsoon as it 'curves back' over the

Bay of Bengal. It includes nearly the whole of the Madras Presidency southwards from Vizagapatam with the exception of the Deccan districts. The annual precipitation ranges from 20" to 50" and above, the average being heavier on the coastal regions. Variability again decreases from south to north.

10. **North-east of the Deccan** is characterised by lowlands with hill frames. East of Indore in Central India its boundaries are carried beyond the Vindhyan escarpment. Varied relief brings considerable local divergencies of rainfall which ranges generally from about 45" in the west to about 60" in the east. The variability is everywhere less than 20 p. c. Hence acute economic distress is rare. Both the branches of the monsoon feed this region. In winters a few cyclonic showers may also occur.

11. This region comprises of Ganjan with the eastern Ghats South of Puri. Rainfall is considerably lower than that of the Mahanadi Delta, and is less on the coast than in the upland interior. In this respect it is allied to the coastal districts in the south and may be regarded as transitional. Variability is tempered as against the south, but Ganjan is liable to serious deficiencies at intervals.

12. The twelfth region covers eastern Rajputana and central India. The former has a rainfall between 20" to 25" and marks the limit of Peninsular India proper. The record of Ajmer shows that the fluctuations are very marked and it has more years of serious deficiencies than any other station in the peninsula. In central India rainfall recovers beyond Eastern Rajputana but diminishes towards the Gangetic trough.

13. The thirteenth region covers Khandesh with Berar and north-east Hyderabad. The western part lies apart with its low rainfall (5" to 20") and higher variability. In eastern Khandesh and Berar and north-east Hyderabad, the rainfall is between 30" and 40" increasing towards the Khandesh side. Though rainfall is more reliable than in the Deccan, the area does not come within the zone of 20 p. c. variability and this is the chief region for its inclusion from region No. 10.

THE MAJOR CLIMATIC REGIONS OF INDIA

While concluding this topic, it is usual to incorporate all the above information about the climate of India into what we call the **major climatic regions**. Dudley Stamp in the latest edition of his 'Asia' has broadly divided the country into two parts* *i. e.*, (1) Tropical India and (2) Continental India, separated roughly by the Tropic of Cancer. There is nothing wrong with this division but upto now we have failed to understand the special desirability of such a division because it is only too obvious. The country has been further divided into eleven regions. Kendrew follows the same scheme (see appendix). The rainfall regions described above should in our opinion form a good basis for a climatic study of the country as rainfall is of paramount importance in the climatology of India. A division of the country into natural regions may be of further help.†

*On the suggestion of Kazi Saeed-ud-Din Ahmad

†This has been done later in this book.

CHAPTER IV

NATURAL VEGETATION.

As is consequent, India has a great variety of natural vegetation owing to a similar variety in rainfall. The truth, however, is that it is only very seldom that one comes across true vegetation in the various localities as most of the land has long been cleared for cultivation. Broadly speaking, however, India may be divided into six vegetation zones :—

- (1) Evergreen Forests of the wet zone.
- (2) Deciduous forests of the Intermediate zone.
- (3) Scrub and grasslands of the dry zone.
- (4) Deserts and semi-deserts of the arid zone.
- (5) Mountain vegetation.
- (6) Tidal forests of the river deltas.

The evergreen forests cover (1) the western coastal plains and the western slopes of the western ghats, (2) lower slopes of the eastern Himalayas, (3) Assam, (4) Eastern Bengal and the Andamans. The trees are mostly of the equatorial type and the tree growth is vigorous. Although the number of botanical species is large, only one species is found in a big stretch of land, a fact which presents serious disadvantages in the exploitation of timber. Stems and bamboos which often comprise the undergrowth are of great commercial use.

The deciduous or the monsoon trees are the most characteristic of Indian forests and formerly covered about 50 per cent. of the country.

It is very seldom that one comes across this type as most of the land has been cleared for cultivation.

Some stretches of these forests are, however, found on the western side of the plateau and on the Himalayan track in the north. Teak, Sal, and sandalwood are the most important trees.

The drier parts of the Deccan and north-west India are covered by dry forests and scrub. The

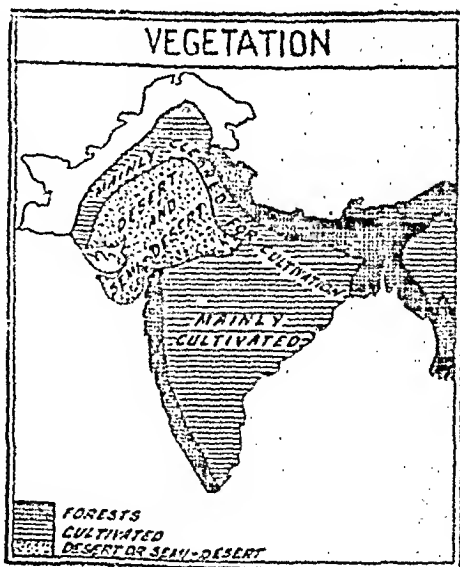


Fig. 22

trees are small in growth but their leaves are thorny. Babul is the most important variety.

A tropical desert region covers a larger portion of Rajputana, southern Punjab and portions of Sindh. Here the rainfall is below 10 inches.

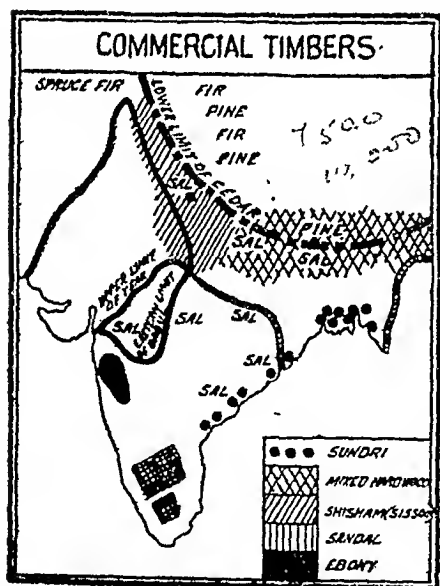
The higher slopes of the mountains - higher than 3000 feet, the Frost line—in the north are covered by the typical mountain vegetation. But in the southern latitudes it occurs at 5000 feet. The nature of this vegetation is hardy trees. Oak, deodars and conifers are the chief species.

Tidal forests usually consist of mangrove trees and abound in the deltaic regions of Bengal and the eastern coastal plains. Sundry is the most important tree of this region.

Fresh-water forests are found a bit higher up from the sea, while the salt-water species abound just on the coasts and portions of their roots go on to the salt waters of the nearby sea.

FORESTS

In 1940-41 about 68 million acres of land were covered by forests or about one sixth of the total area was forested. The following table shows some of the more important provincial figures.



In thousands of acres

C. P. and Berar	15,857.0
Madras	13,178.2
U. P.	9,274.6
Bombay	8,336.1
Bihar	6,606.9
Bengal	4,482.9
Assam	4,153.4
Orissa	2,637.8
Punjab	1,975.2

The total figures show a tremendous decrease in the forests of the country. In 1918 we had about 3.5 lakh square miles. In 1925-26 the figures showed a decrease of about 2 lakhs. Another drawback is that a vast percentage is so situated that it is quite impossible to use them, (specially the great resources of the Himalayas) because of difficult means of transport.

Fig. 23 (After Lorenzo)

The forest products may be divided into (1) Major products such as timber, fuel-woods and (2) Minor products such oils, gums, lacs, etc.*

*Plantation products such as palms, rubber and tea may be quoted as a third type.

Timber and fuel-wood are the most important forest produce and our annual production of timber is sufficient not only to supply our own internal needs but much is sent to foreign markets in Europe. The total production of timber and fuel-wood is about 375,000,000 cubic feet out of which the chief suppliers are Bombay, Central Provinces and Berar, U. P., Punjab and Bengal. We have very little pulping wood. Insects like the white ant, and rot shorten the life of our timber.

Lac is perhaps the most important minor produce. It is a kind of sticky matter secreted on the branches of certain trees by an insect. Out of a total of world production of 1,699,000 maunds of lac per year. India claims about 1,200,000 maunds; the chief producers are Bihar, Chotta Nagpur, Bengal, Central Provinces and United Provinces. Bihar gives about 60 per cent. of the world total.

Our local requirements cover only about two per cent of the total production and the rest is exported to U. S. A., Japan, Germany, France and United Kingdom. More than 90 per cent of the lac exports pass through Calcutta.

Amongst the oils, Sandalwood oil is the most important. It comes chiefly from the sandalwood forests of Mysore. Some is also had from Madras, Coorg, C. P., and Bombay.

For administrative purposes forests are classified as under :—

- (1) Reserved Forests—107,000 sq. miles.
- (2) Protected Forests—6200 " "
- (3) Unclassed Forests—135,700. "

Reserved forests belong to the Government. "Protected forests are those over which Government have proprietary rights but which are not included in reserved forests." Government have a right to declare any class of forests as reserved ; or close any part of a forest for a period upto 20 years. All other forests are classed as "un-classed."

Steps are being quickly taken towards a systematic working of forests. The Forest Research Institute at Dehra Dun is doing much research work in this direction. Three problems seem to be attracting much attention.—(1) To find out suitable wood for aircraft building ; (2) To find out suitable pulping-wood for making paper and; (3) to find out suitable wood for electrical purposes. Now we can get along without importing plywood, battery separators, shuttles used in textile mills and many other similar items.* Besides, there are hopes of producing large quantities of turpentine oil, rubber and medicinal herbs. Forests are expected to play an important role in the manufacture of cellulose whose importance is bound to increase in the coming years.

*Modern Review, December, 1942 p. 445.

AFFORESTATION AND DEFORESTATION

It is hardly necessary to give all the direct and indirect uses of forests here. We have already described some of the more important forest products like timber and oil. It is perhaps generally realised that tree fodder, forest grasses and shrub growth contribute to the feeding of livestock. It may, however, be interesting to learn some of the indirect uses. Forests afford a good cover for the soil, and thus mitigate the danger of soil erosion, a problem which has suddenly become acute in India owing to the unwise policy of clearing the forests or deforestation followed during the centuries gone by. A lot of soil is formed by the disintegration of the rocks and this fully replaces the quantity taken away by rain-water. The undergrowth and leaves rot to form humus which is rich in plant food. The forests lower the temperature and help in condensing the clouds and thus bring rain-fall. They enable the soil to retain the moisture. Floods are often prevented by the presence of forests.* It is because of these points that it is said to be desirable to have at least 25 per cent of the total area of a country under forests.† It is unfortunate, therefore, that in most of the Indian provinces the area under forests is disappointingly low as is shown in the following table.

Punjab	5.1 p. c.	Bombay	17.1 p. c.
N. W. F. P.	2.1 p. c.	Orissa	14.7 p. c.
Bihar	6.2 p. c.	Bengal	14.0 p. c.
Sindh	2.5 p. c.	Ajmer=Merwara	5.1 p. c.
Madras	12.2 p. c.		

So great was the destruction of forests in India that in 1855 the Government drew up rules and regulations to preserve forests in the hills. A special Forest Act was passed in 1918† and forests in more important places like river catchments were preserved. More effective and constructive measures are yet needed to bring back the things to normal. A policy of afforestation has now begun. In most of the provinces we have now special branches in the Forest Departments whose business it is to do useful work towards afforestation and consequent soil preservation. "The afforestation of the upper catchment areas of the rivers and the proper and sustained management of both the reserved and the village forests" is advocated as a cure for soil-erosion by Sir Harold Glover in his Pamphlet, "Soil Erosion" (p. 32).

*The frequent floods in Orissa are often attributed to the deforestation of hill slopes of Chotta Nagpur.

†Gorrie, Land-management p. 11.

‡Glover, Soil Erosion p. 8,

Timber and fuel-wood are the most important forest produce and our annual production of timber is sufficient not only to supply our own internal needs but much is sent to foreign markets in Europe. The total production of timber and fuel-wood is about 375,000,000 cubic feet out of which the chief suppliers are Bombay, Central Provinces and Berar, U. P., Punjab and Bengal. We have very little pulping wood. Insects like the white ant, and rot shorten the life of our timber.

Lac is perhaps the most important minor produce. It is a kind of sticky matter secreted on the branches of certain trees by an insect. Out of a total of world production of 1,699,000 maunds of lac per year. India claims about 1,200,000 maunds; the chief producers are Bihar, Chotta Nagpur, Bengal, Central Provinces and United Provinces. Bihar gives about 60 per cent. of the world total.

Our local requirements cover only about two per cent of the total production and the rest is exported to U. S. A., Japan, Germany, France and United Kingdom. More than 90 per cent of the lac exports pass through Calcutta.

Amongst the oils, Sandalwood oil is the most important. It comes chiefly from the sandalwood forests of Mysore. Some is also had from Madras, Coorg, C. P., and Bombay.

For administrative purposes forests are classified as under :—

- (1) Reserved Forests—107,000 sq. miles.
- (2) Protected Forests—6200 " "
- (3) Unclassed Forests—135,700. "

Reserved forests belong to the Government. "Protected forests are those over which Government have proprietary rights but which are not included in reserved forests." Government have a right to declare any class of forests as reserved ; or close any part of a forest for a period upto 20 years. All other forests are classed as "un-classed."

Steps are being quickly taken towards a systematic working of forests. The Forest Research Institute at Dehra Dun is doing much research work in this direction. Three problems seem to be attracting much attention.—(1) To find out suitable wood for aircraft building ; (2) To find out suitable pulping-wood for making paper and; (3) to find out suitable wood for electrical purposes. Now we can get along without importing plywood, battery separators, shuttles used in textile mills and many other similar items.* Besides, there are hopes of producing large quantities of turpentine oil, rubber and medicinal herbs. Forests are expected to play an important role in the manufacture of cellulose whose importance is bound to increase in the coming years.

*Modern Review, December, 1942 p. 445.

AFFORESTATION AND DEFORESTATION

It is hardly necessary to give all the direct and indirect uses of forests here. We have already described some of the more important forest products like timber and oil. It is perhaps generally realised that tree fodder, forest grasses and shrub growth contribute to the feeding of livestock. It may, however, be interesting to learn some of the indirect uses. Forests afford a good cover for the soil, and thus mitigate the danger of soil erosion, a problem which has suddenly become acute in India owing to the unwise policy of clearing the forests or deforestation followed during the centuries gone by. A lot of soil is formed by the disintegration of the rocks and this fully replaces the quantity taken away by rain-water. The undergrowth and leaves rot to form humus which is rich in plant food. The forests lower the temperature and help in condensing the clouds and thus bring rain-fall. They enable the soil to retain the moisture. Floods are often prevented by the presence of forests *. It is because of these points that it is said to be desirable to have at least 25 per cent of the total area of a country under forests.† It is unfortunate, therefore, that in most of the Indian provinces the area under forests is disappointingly low as is shown in the following table.

Punjab	5.1 p. c.	Bombay	17.1 p. c.
N. W. F. P.	2.1 p. c.	Orissa	14.7 p. c.
Bihar	6.2 p. c.	Bengal	14.0 p. c.
Sindh	2.5 p. c.	Ajmer=Merwara	5.1 p. c.
Madras	12.2 p. c.		

So great was the destruction of forests in India that in 1855 the Government drew up rules and regulations to preserve forests in the hills. A special Forest Act was passed in 1918† and forests in more important places like river catchments were preserved. More effective and constructive measures are yet needed to bring back the things to normal. A policy of afforestation has now begun. In most of the provinces we have now special branches in the Forest Departments whose business it is to do useful work towards afforestation and consequent soil preservation. "The afforestation of the upper catchment areas of the rivers and the proper and sustained management of both the reserved and the village forests" is advocated as a cure for soil-erosion by Sir Harold Glover in his Pamphlet, "Soil Erosion" (p. 32).

*The frequent floods in Orissa are often attributed to the deforestation of hill slopes of Chotta Nagpur.

†Gorrie, land management p. 11.

‡Glover, Soil Erosion p. 8,

CHAPTER V

AGRICULTURE IN INDIA*

India is essentially an agricultural country. More than 75 per cent of her population are in some way or the other connected with agriculture. About fifty per cent of the total area is under cultivation. The following two tables give an insight into the actual state of affairs.



Fig. 24.

Table I

Land Utilization Figures (in millions of acres).

	British India	Indian States
Total area	=511	147
Forests	= 68	19
Not available for agriculture	= 89	28
Cultivable waste	= 97	19
Current fallows	= 47	13
Net area sown	=210	68
Percentage of the sown to total area	= 41	47

*Matter from Mr. V. S. Mathur's thesis on Agricultural Development of Western United Provinces" has been freely used in this chapter.

Table II

Occupational Percentages

Agriculture	... 67.1 p. c.
Minerals	... .02 p. c.
Industry	... 10.1 p. c.
Trade	... 5.1 p. c.
Public Force	... 0.6 p. c.
Public Administration	... 0.7 p. c.
Transport	... 1.5 p. c.
Professional and Liberal Arts	... 1.5 p. c.
Miscellaneous	... 13.3 p. c.

In India "farming is not a business, it is a tradition." Since long Indian agriculture has been a "gamble in rainfall" specially in regions getting low precipitation. Irrigation therefore plays a very important part in Indian agriculture. In 1939-40 more than 22 per cent of the gross cultivated area was irrigated. Irrigation facilities are not so very satisfactory in the Indian states where out of a total of 68 million acres of cultivated land only about 10 million acres (or about 16 per cent) are under irrigation. The following table shows (Indian Year Book 1943-44) the irrigated percentages for the various Indian provinces:—

Madras	20.49 p. c.
Bombay	1.71 p. c.
Bengal	0.81 p. c.
United Provinces	14.53 p. c.
Punjab	38.80 p. c.
Bihar	3.40 p. c.
C.P. (excluding Berar)	1.50 p. c.
N. W. F. P.	18.28 p. c.
Orissa	4.68 p. c.
Sindh	89.12 p. c.
Rajputana	6.82 p. c.
Baluchistan	4.76 p. c.

Another important advantage of irrigation is that double-cropping is made possible. In U. P. and the Punjab which are perhaps the most irrigated provinces of India, about 78 and 44 lakh acres are cropped more than once. Similar figures for Bombay, Bihar (and Orissa), and Madras are 14, 52 and 61 lakhs of acres respectively.

Irrigation also affects the yields of crops. Experiments and experience reveal that average yields of irrigated areas are appreciably higher. According to the estimates of Chinsura Agricultural Farm the average yield of paddy grown without irrigation is as low as 15 maunds per acre as compared to 28 maunds of paddy grown with irrigation. According to the information collected by Mr. V.S. Mathur (one of the authors of the present book) the average

increase of irrigated crops is as follows (with particular reference to western U. P.) :—

Finished Rice—	100	pounds	per	acre.
" cotton—	70	"	"	"
Wheat—	150	"	"	"
Barley—	150	"	"	"

TECHNICALITIES OF CROP PRODUCTION

1. Systems.

There is no homogeneous system of agriculture followed in India. The causes are too obvious to mention here in detail—differences in physical and climatic conditions. As given by Dr. Lorenzo in his 'Atlas of India' the following four systems may be recognised :—

- (1) Wet cultivation or farming.
- (2) Humid Farming.
- (3) Irrigation Farming.
- (4) Dry Farming.

Wet cultivation is carried on in very wet regions getting more than 80 inches of rainfall. It is characteristic of the Malabar Coast, the lower Bengal and of the central and eastern sub-Himalayas. Many crops are produced in a year and only crops like rice and jute that require abundant water are raised.

Humid cultivation or farming is characteristic of regions that get comparatively lower rainfalls—about 40" to 80". It is mostly found in the central Ganges Plain, the Deccan and C. P. Two and often three crops of somewhat drier type are usually raised, the third is usually a catch crop and is termed *zaid*.

Irrigation farming is naturally carried on in regions getting lower than 40" of rainfall. The Upper Ganges plain, the Punjab plain, portions of Sindh and Northern Madras are the chief regions for this particular type of farming. Usually the land is subject to double-cropping (Rabi and Kharif).

Dry farming allows only one crop to be produced and is carried on in rather very dry areas getting even lower than 20" of rainfall.

2. Technicalities.

'Crop' is a term used to describe a group of similar plants growing together in a particular area. To grow a crop the fields must be ploughed, watered and then sown with seed. After the seed has been sown the young plants require frequent watering and food which they extract from the soil. Unless all these things are given a plant cannot thrive well.

Water can be given to the plants either by natural rainfall or in

its absence from artificial irrigation. We have described how with the help of irrigation double cropping has been made profitable. Here we are to study other aspects of crop production and its development.

For ploughing the Indian farmer uses a plough, a rough wedge-shaped block of hard wood with an iron sole, pointed at one end to facilitate the breaking of the soil. It has a handle by which it is guided and the beam projects in front by which it is drawn by bullocks. After the ploughing is finished the fields are levelled by means of a flat log of wood drawn over the fields by bullocks, the driver standing on the log. In the absence of the plough a spade is also used for breaking the soil in small areas. The plough should go deep into the soil and the deeper it goes, the better it is. The local plough is defective and is not able to go sufficiently deep into the soil with the result that the soil is not broken properly. It has been replaced by many new types of improved ploughs introduced by the departments of Agriculture. The Meston Plough, the Punjab Plough and the Turnwrest Plough are amongst the better types of improved ploughs. Their efficiency lies in the depth that they reach into the soil and in breaking soil lumps.

Then comes the question of plant food. The plants extract food from the soil through the roots all along the period of their growth. Thus the supplies of food in the soil are gradually decreasing. To maintain their efficiency it is essential to make up this deficiency by artificial means. The process of adding artificial food to the soil is called *manuring* and the food thus added is known as *manure*.

The only manure that has been popular in India is cattle dung. But unfortunately owing to a lack of fuel, very small quantities of dung are used as manure. Most of it is made into cakes, dried and burnt as fuel. The cow dung is held as something sacred by the Hindus and sometimes is used for plastering the walls especially of the kitchens and of the rooms of worship. To enable the farmer to give more of his dung to his fields, we want some other cheap fuel or if the dung is to be used as fuel, we want other manures. Other fuels are not available and if there are any like coal or coke, gas or electricity, they are too expensive. The only solution seems to encourage the cultivation of quick-growing trees near the villages. The other alternative that has been found practicable is the introduction of other useful manures. Compost made of plant remains, weeds, leaves, straw and fodder removed from the cattle sheds and the small quantities of dung available, is nowadays the most popular manure. It is being widely used in the Government and private farms. One indirect advantage of Compost-making is that it leaves the village very clean after all the rubbish has been collected. We think that Compost making should be encouraged as a useful means of adding to the fertility of the soil and also as a sanitary measure.

Green manuring is also rapidly gaining popularity. The process

comprises of growing a leguminous crop and then ploughing it down. 'Sanai' is recommended by the Government farms as the best green manuring crop.

Human excreta and town drainage can also be utilised as fertilisers. Both these measures are only possible in the bigger towns and cities where there is a proper drainage system. In the villages and the smaller towns, it is quite impossible to adopt any of the measures owing to the absence of proper drainage systems. Introduction of drains and sanitary lavatories may be considered. For the time being use may be made of the town drainage and other refuse for manuring the fields lying nearby.

Many other artificial fertilisers like nitrate of soda, sulphur phosphate, sulphate of ammonia, bone meal, sulphate of potash, castor and 'neem' cakes have been introduced; but their high prices prohibit the farmers to use them. They are really agricultural luxuries and are used only by those who do farming not as a profession but as a hobby and by those who are competing for some prizes in the agricultural contests. Even the Government farms use Compost and green manuring and the costly fertilisers are used only in experiments.

Much also depends on the quality of the seed sown. If it is of a good family the yields may be good and if it is of a low quality family the yields may be low. To find out a seed of uniformly good qualities, is another department of agricultural development. This is possible by selection or by breeding methods. In the former case the most promising plants are selected for cultivation and gradually their cultivation is multiplied. The idea finds its basis in the admitted fact that the qualities of the parent plant are inherited by the future generations. The divergence between the climatic conditions of different localities necessitates selection of a variety suited to the climatic and soil conditions of a particular area. One type may flourish in one locality and may be a complete failure in the other. Selection of varieties for different localities should be guided by the geography of the localities concerned. In the latter case use is made of artificial breeding between different varieties. This produces a type that did not exist before. The system is technically known as *Hybridization* and the varieties thus evolved are called *Hybrids*. The underlying idea is to combine the good qualities of different varieties into one by crossing and re-crossing. If a high yielding variety is crossed with a variety of good quality, the third variety thus produced will contain both the 'quantity' and the 'quality' qualifications. Trials have to be repeated a number of times before any definite success can be claimed. The introduction of these varieties, again, should be guided by geography.

The last stage in the cultivation of a crop is harvesting and when a crop has been reaped it is thrashed and winnowed. Harvesting of corn crops is usually done by big scissors. Thrashing and

winnowing are slow processes. When the crop has been harvested it is spread on the threshing floor and trodden by oxen which process separates the corn from the straw. Then this mixture of corn and straw is flung into the air by means of baskets locally called 'Chaz,' the grain being heavier falls on the ground while the husk is carried away by the wind. These are slow processes and are liable to involve a lot of waste. Improved threshing machines and threshers have been introduced. Improvement has also been effected in winnowing by the introduction of more scientific methods. Sugar-cane is cut by long scissors or by big knives and its root is left in the soil to grow again. This process is called 'Ratooning.' When ratooning is not in view cane is dug out by 'Phaoras.' Cotton is picked by hand.

Double-cropping. The system of cultivation is determined by the climatic distribution during the length of the year. Some crops thrive in high temperatures, while others require low temperatures for their growth. There are two distinct divisions of seasonal crops in our country, *e. g.*, (1) those that thrive in the summer and (2) those that thrive in the winter. The latter is referred to in India as 'Rabi' and the former as 'Kharif'. A third may be grown as a catch in between—*Zaid*.

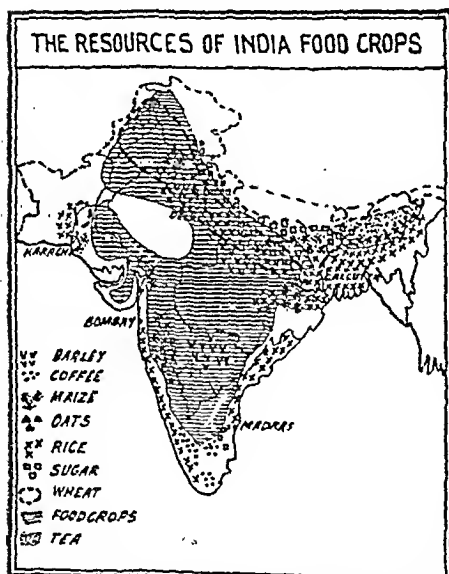
Agricultural Cycle. As soon as the first rain falls in summer, crops like rice, cotton, and maize, are sown. They thrive in a warm, moist weather. They are ready for harvesting by September. Meanwhile preparations begin for winter crops that are sown in October and November. Wheat and barley and gram are the staples at this season. They are sown generally with artificial irrigation except in unusually favourable years when there are some showers in the end of October. The winter crops are ready for harvesting in March and April. Sugar-cane has a season of its own. It is planted in February and March with irrigation and harvested in October, November and December and sometimes the harvesting is prolonged to even January. But this is counted as a summer crop as most of its growing period lies in the summer months. Introduction of irrigation has allowed the sowing of summer crops a bit earlier than the usual time, so that by the time the Monsoon breaks they are in a sound growing state and are not liable to great injury by the heavy torrential rains and derive full benefit from the rainfall. Winter crops are mostly irrigated and also the summer crops in the times of rainfall scarcity and in the areas where rainfall is not sufficient.

Food and Commercial Crops. According to their utility and use, crops are either *food* or *commercial* crops. In the latter capacity we include fibres, oil seeds, drugs, and also fodder crops. *Vegetable or garden crops* and fruit crops may also be included in the list of agricultural crops although they claim only about 2 per cent of our total cultivated area. The following table (as quoted by Messrs

Pugh and Dutta) gives the pre-war* relative importance of the various classes of crops.

Foodgrains	75.7	p. c. of the total area sown.
Fibres	7.3	" "
Oil seeds	7.3	" "
Fodder crops	3.9	" "
Sugar-Cane	1.1	" "
Condiment and Spices	0.5	" "
Drugs and Narcotics	0.8	" "
Dyes and Tanning Material	0.2	" "
Fruits and Vegetables	1.6	" "
Miscellaneous Food Crops	1.0	" "
" Non-Food Crops	0.6	" "

Now that we have seen the lines of the agricultural development and the nature of crop production in our country, we are in a position to study each crop in detail. It will be seen that from the point of view of production, food crops specially wheat and rice, are the most important, while from the point of view of exports non-food crops like tea, cotton, jute and oil seeds are predominant.



FOOD CROPS

1. Rice. Rice is an aquatic plant and requires for its growth an abundance of water and a high temperature. The summer temperatures of practically the whole of

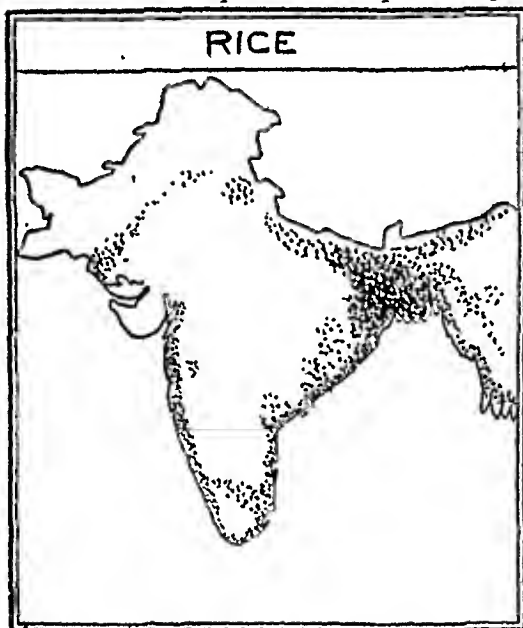
Fig. 25. (Reproduce from Hindustan Times) India are quite suitable for rice cultivation and it is widely grown in parts with heavy summer rainfall (above 40"), e. g., in Bengal, Madras, Bihar and Orissa. The Indian crop of rice contributes 60 to 65 per cent of the world's production (excluding China exact figures of whose production are not known). In India it is the most extensively grown crop occupying every year about 80 million acres. In 1939 the area under rice was distributed as given below : —

Bengal	21.99 million acres
Bihar	9.95 " "

*Owing to war conditions, food crops are being increasingly cultivated.

Madras	9.85	million acres
U. P.	7.56	" "
C. P.	5.79	" "
Assam	5.44	" "
Orissa	5.14	" "
Bombay	1.70	" "

The most important rice producing areas in the country are



situated in Bengal and the neighbouring deltas on the eastern coast where about 75 per cent of the total cultivated land is under rice. Bengal along with Bihar, Orissa and Madras claims about 80 per cent of the total rice in India. In 1937-38 out of a total of 26,737,000 tons, the above-mentioned provinces claimed about 18,651,000 tons. In U. P. and the Punjab, rice is mostly grown with the help of irrigation except perhaps in eastern U. P. where the rainfall is higher than 40". Usually 2 to 3 crops of rice are raised in most of the rice-producing areas.

Fig. 26. Each dot=50,000 acres

The average yield of rice in India is about 728 lbs. per acre. This figure is very low when compared to the yields in some other countries. The following table is quite illustrative :—

YIELD OF RICE PER ACRE

(1938-39)

Italy	2,903 lbs.	U. S. A.	1,469 lbs.
Japan	2,276 lbs.	Thailand (Siam)	943 lbs.
Egypt	2,153 lbs.		

This low figure is mainly due to poor and defective methods of cultivation and a lack of manures. The varieties of seed used are also of the low type. In the whole of the country only about 3,759,000 acres or about 5.1 per cent of the total area is under improved crops. The reasons are the poverty and the illiteracy of the farmer.

Rice is the staple food of most of the Indians. Each province consumes the greater part of its own production. Bengal and South

India export a part of their production and used to import low grade rice from Burma. Most of the exported rice goes to Ceylon and Strait Settlements. Some also finds its way into European and British markets. Huge quantities of Burma rice used to be exported to Europe. Burma's separation from India in 1937 has tremendously lowered the figure of Indian rice exports. By way of example, the total rice exports from India in 1934-35 were 1,590,000 tons while in 1937-38, the total came down to 218,311 tons.

TECHNICAL ADVANCES IN RICE CULTIVATION

The creation of the Imperial Council of Agricultural Research has brought about great development in rice production. Many rice research stations have been opened. There is not much difference between the yields of different improved varieties. Mr. V. S. Mathur asked the officer in charge at a station as to what types they recommend to cultivators. The officer replied that not much stress is laid on any particular type but the cultivator is only advised to grow early maturing varieties of any description found out by the department.

It may be interesting to note that generally two processes of sowing rice are adopted, e.g. (1) transplanting and (2) broadcasting. In the former case the seed is first sown in a nursery and after about a month's time when the young plants are about 10 to 12 inches high, they are removed from the nursery and planted out in the rice fields. In the latter case the seed is sown after the first shower of rain and germination takes place only when rains set in. This is a process that is followed for early maturing varieties.

The numerous experiments about the manuring of rice that have been done "point to the great value of organic manures, including green manuring in increasing production." Generally rotted dung is applied to the nurseries for transplanted rice. Mr. Sethi, the ex-economic botanist to the U. P. Government has spoken very highly of the practice of taking a leguminous crop before and after rice as a cheap method of reviving the fertility of the soil. Other fertilisers like cakes of castor and 'neem' are useful but relatively expensive. There is a danger of these fertilisers being washed away by floods and rains that usually accumulate in the rice fields.

Weeds and Pests. Common weeds that a farmer has to encounter in his rice fields are wild Kodon, and Makra grass. Most of these are difficult to distinguish from young rice plants in their early stages. "The control and eradication of weeds depend upon the frequency and thoroughness of cultivation which should be continued as long as weed growth is noticeable."

The pest that is very injurious to rice plant is locally called Gundhi. This fly is a very dirty and bad smelling insect. It sucks

the juice out of the green leaves. They generally multiply from the middle of August to October. The beginning of cold weather kills them. Catching the flies by means of bags and killing them is so far the only effective method of reducing their number. Keeping the fields clear of weeds and applying powdered cake of neem is useful in mitigating their effect.

The U. P. Sathi type that matures in 60 days is quite immune from the Gundhi attack. Its ears are covered by leaves and the fly cannot reach them. Many crosses have been attempted with Sathi. The F. 5 type is successful to some extent but perfection is still a thing of the future. Mr. T. R. Mehta, the assistant Paddy Specialist, stationed at Nagina, during the course of an article in a vernacular paper, suggests two alternatives for protection from Gundhi. (1) Sathi type should be grown if early maturing rice is sown, (2) Late varieties should be grown. The remedies suggested by the expert seem to be quite antagonistic to the rice development. If all the improved varieties are to be placed by the Sathi type, which is a local unimproved variety, all the researches should better be stopped as they will be of no avail ; and if late varieties are to be grown no winter crops can be sown in time. This advice might take a wrong turning and hamper the development. On the one hand, they want the cultivator to use early maturing varieties of the improved type, while on the other hand, when they are faced with the Gundhi problem, they revert to the same old tradition of sowing local late maturing varieties. The salvation of the problem of rice development lies either in finding out of a variety having good yield, of early maturing habit and enjoying immunity from Gundhi, or in finding out a method that may resist the Gundhi attack.

Before we leave this section, it is desirable to study the methods employed for husking *i. e.*, for separating the rice grain from the husk. Two methods are generally employed. The first is called Bhujia system and the second is called the Kacha system. In the former case the grain is first put in water, dried and then the grain is separated from the husk by beating it with a Dhenkli, a crude form of mortar and pestle. In the latter case paddy is pounded without being wetted.

2. Wheat. Next in importance to rice comes wheat. It occupies about 11 per cent of the total cultivated area *i.e.*, less than half under rice.

Wheat is the chief cold weather or rabi crop of India and is harvested from March to May. It thrives in climatic conditions exactly opposite those suitable for rice, hence it is naturally important in places where rice is unimportant.

More than 90 per cent of the total wheat crop is grown north

and west of a line drawn across the Southern peninsula from Calcutta to Bombay. The map shows that the largest concentrations of wheat production are found in Sindh, Punjab, the United Provinces and in portions of Bihar. Production is also carried on in the N. W. Frontier Province, Delhi and drier portions of Bengal and Central India. In the south wheat is cultivated largely in a few spots in the Bombay Presidency and in Hyderabad. It is mainly produced as an irrigated crop because the rainfall is rather low during this period.

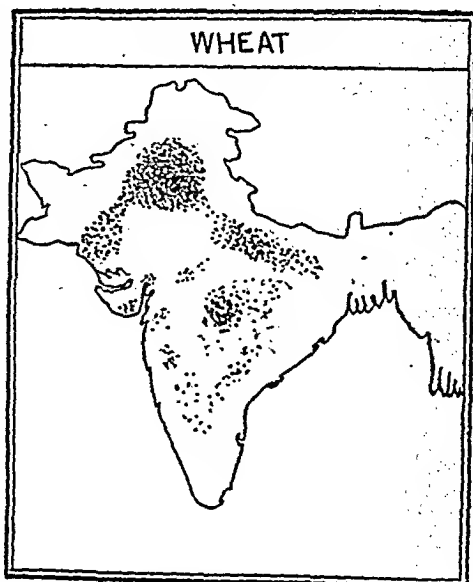


Fig 27. Each dot=10,000 acres.

India claims about 34 million acres and about 11 million tons of wheat every year, out of which only about 19 per cent is under improved varieties. The following table gives provincial figures.

Punjab	9.4 million acres
U. P.	7.5
C. P.	3.4
Bombay	1.6
Sindh	.6
C. I. States	2.0
Gwalior	1.3
Hydrabad	1.2
Punjab states	1.3

About two fifths of the total wheat crop in British India is irrigated. About 50 per cent of this lies in the Punjab which represents the highest percentage of irrigated wheat. In U. P. about half of the wheat is irrigated. In Sindh the opening of the Sukkur Barrage has greatly helped wheat cultivation.

Owing to primitive methods of cultivation, the average yields per acre in India are very low when compared to the average yields in some other countries. The following table speaks for itself.

Europe	1,146 lbs. per acre
U. S. A.	846
Canada	972
Argentine	780

Australia	714	
India	636	"

For more than four decades wheat has figured prominently in the programme of agricultural researches. Both selection and cross-breeding methods have been used.

Wheat is the staple food of the people in U. P., the Punjab and N. W. F. Province. Elsewhere it is produced for export. Before the war very little wheat was exported. In 1938-39 only about 10 lakh rupees worth of wheat was exported. This is due to the low quality of Indian wheat and to the increased supplies from Argentine, Canada and Australia. In fact not long ago we imported wheat in fairly large quantities from Australia.

3 Sugar-cane*. Sugar-cane is indigenous to India. According to existing records the cultivation of sugar-cane in India dates back to the Hindu period, although it was probably in cultivation long before that. It was from here that its cultivation spread out to the neighbouring countries and later to America. But even today the area devoted to sugar-cane in India is greater than in any other country of the world.

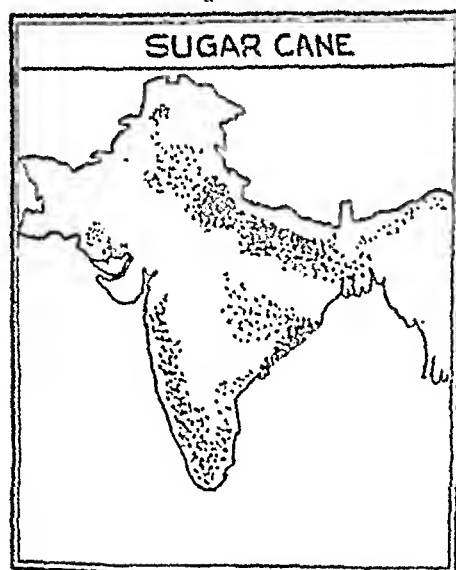
Sugar-cane is essentially a tropical and sub-tropical crop. Temperature and water supply are the chief factors in the cultivation of sugar-cane. Rich and loamy soils having phosphates and lime are most suited to its cultivation. The soil should be well-drained. Naturally sugar-cane should have been more widely cultivated in Bengal and Bihar but the growth there is checked by poor soil aeration and the rapid increase of the rain-inundated area, where rice is naturally a more suitable crop. The conditions are favourably met in United Provinces hence its supremacy in the sugar-cane cultivation. Next in importance comes the Punjab. The following table is quite illuminating :—

U. P.	...	...	2,127,000	acres.
Punjab	...	...	512,000	"
Bihar	...	...	342,000	"
Bengal	...	...	290,000	"
Madras	...	...	98,000	"
Assam	...	...	39,000	"
C. P.	...	...	33,000	"
Hydrabad	...	...	30,000	"
Total for India	...	...	3,818,000	"

The cultivation of sugar-cane has made enormous progress during the recent years and the acreage has increased by about 1,000,000 acres between 1925-26 and 1937-38. The credit for this rapid advance must be given to the Imperial Council of Agricultural Research. The Government is reported to have spent more than

* Prof. George Kuriyan's paper on sugar-cane read at Lahore session of the Indian Science Congress 1939, is a fine contribution.

Rs. 35 lakhs on sugar research. Now India has mostly stopped her



imports of Java sugar. The sugar-cane industry has made rapid progress during the last fifteen years or so and the number of sugar factories has increased tremendously from 27 in 1929-30 to 148 in 1940-41. The figures for manufactured sugar also show an appreciable increase from 310,918 tons in 1929-30 to 1,345,000 tons in 1940-41. But in spite of this increase in the acreage, the yield of sugar-cane in India is very low as compared to Java and U. S. A. The reasons are too obvious to need any detailed elaboration.

Fig. 28. Each dot \approx 2,000 acres

Java	...	...	54.91	tons per acre
U. S. A.	...	...	20.06	"
India	...	...	12.66	"

In the country itself, yield varies from province to province. It is higher in irrigated areas and in regions where technical development has taken place. The following table gives some sugar figures :—

Madras	...	...	6,075	lbs. per acre.
Baroda	...	...	6,007	"
Bombay	...	...	5,422	"
Bihar	...	...	3,287	"
U. P.	...	...	2,548	"
Punjab	...	...	1,764	"

The area under irrigated sugar-cane has ever since been on the increase. Now about 60 per cent. of the total area under sugar-cane is irrigated.

4. Barley. Barley forms a fair proportion of the winter crops. Out of about more than 6½ million acres under barley, United Provinces claim the largest percentage. Next come Bihar and Orissa closely followed by the Punjab. The following table gives individual figures (1937-38).

Provinces and states.	Area in acres	Yield in tons
U. P.	3,755,000	1,301,000
Bihar and Orissa	1,301,000	462,000
Punjab	777,000	206,000
N. W. F. P.	179,000	55,000
Bengal	95,000	30,000
Ajmer-Merwara	52,000	16,000
Bombay	15,000	4,000
Hyderabad	13,000	2,000
Sindh.	18,000	4,000
C. P. and Berar	15,000	3,000
Delhi	15,000	5,000
Total	6,245,000	2,089,000

Climate plays a very important part in the cultivation of barley.

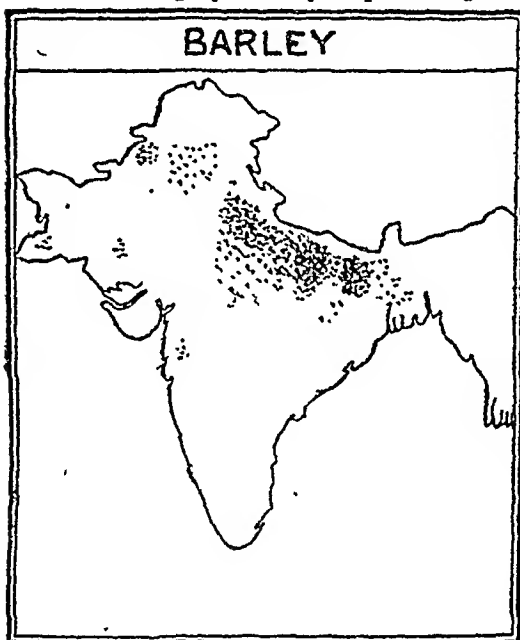


Fig. 29.

It requires some moisture and cool weather during the time of germination and early growth, bright and warm weather in its later stages, a little moisture sometimes and before ripening and then again warm, dry and sunny weather. Bihar and Orissa are rather warm and the absence of low temperatures at the time of its sowing in October is rather harmful to barley, hence their low acreage under barley. In the Punjab the requirements are quite reasonably met but owing to the predominance of wheat, barley is little cared for. In U. P. wheat is more important in the irrigated regions and barley in the

rest, because the only difference in the requirement of the two is that barley requires comparatively lower quantities of water.

Barley has for long been exported to England for malting purposes and it has always been a complaint that the Indian barleys are of poor quality and that serious contamination with weeds and other seeds has been quite common. Its infestation with the *Kapia* beetle is also not a bright factor. The exports have greatly dwindled down and the present exports of barley are very

negligible. The crop has also to satisfy a large internal demand as along with Jawar and Bajra, it forms the poor man's food in India. It is said to be richer than rice and millets in protein content and fat.

5. Millets. There are two classes of Indian millets *i. e.*, Jowar and Bajra. They are important food crops for a majority of people in Madras, Bombay and in the Hyderabad State. They also supply good fodder for cattle.

Millets are usually grown in this country as a Kharif crop but

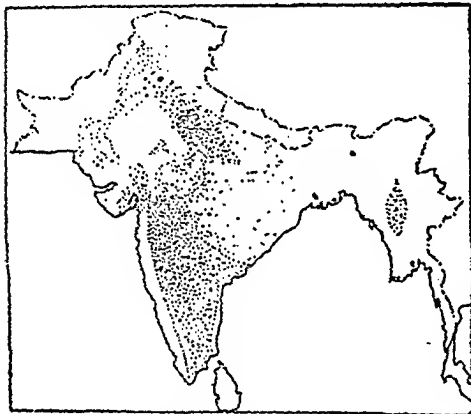


Fig. 30. Each dot=50,000 acres

more usually as a catch (particularly Bajra). Some millets like Jowar are also grown in South India as a Rabi crop. Their water requirements are quite simple. They are, therefore, grown in places getting less than 40" of rainfall. They thrive quite well in sandy loams or well drained light soils. But exactly their soil requirements are quite flexible and they thrive on all types of soils even in soils which are too poor for most other cereals.

In 1939-40 about 33.39 million acres were under jowar and about 17.22 million acres under bajra in the whole of India. The following table shows provincial figures for Jowar and Bajra.

	Jowar	Bajra
Hyderabad	7.53 million acres	1.94 million acres
Bombay	7.94 "	4.01 "
Madras	5.05 "	2.82 "
C. P. and Berar	4.79 "	1.01 "
U. P.	2.31 "	2.39 "
Punjab	.90 "	3.06 "

The total yield of Jowar in 1930-40 was about 6,435,000 tons while that of Bajra was 2,540,000 tons.

There is no large export trade in either Jowar or Bajra. In 1939-40 only about 7,000 tons of Jowar and Bajra was sent out as compared to about 15,000 tons in 1929-30.

6. Pulses. India produces a great range of pulse crops. Pulses are important both from the point of view of husbandry and of nutrition. They help a more efficient and effective rotation of crops. They are also a good source of protein. The more widely grown pulses are gram

(dealt with separately), tur, moong, arhar and urd. Different pulses are grown in different seasons; most of them however, are grown with Kharif crops and harvested in September and October. Gram is a winter or a Rabi crop. Pulses form a regular and important part of diet all over the country and owing to the great internal demand not much pulses are exported. In 1939-40 only about 73,000 tons of pulses were exported.

Pulses are grown all over the country in all types of soils, but the chief regions are Bihar, Central Provinces, Bengal, United Provinces, Bombay, Madras and Assam. No exact figures for these pulses are available.

7. Gram. As has been said before gram is perhaps the most common of all the pulses in India. It is used as a human as well as an animal food. It is a very old and regular crop of the country.

Unlike most of the other pulses, gram is a rabi crop. Frost, however, is not very much relished. Only limited moisture is needed. Heavy and well-drained soils are best suited for its cultivation. It is grown practically in all the parts of the country but more particularly in the Punjab, United Provinces, Bihar, Central Provinces and Berar and Hyderabad. In the whole of the country about 17,216,000 acres are under gram and the annual production is estimated to be about 2,540,000 tons.

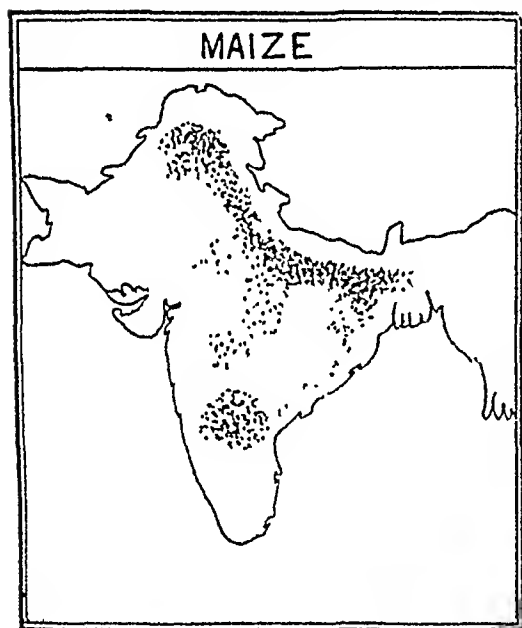


Fig. 31.

8. Maize. Unlike U.S.A., about 75 per cent of the Indian maize is consumed as human food. Only the leaves and stalk are given to the animals.

Maize is mainly grown as a Kharif crop, as it requires plenty of moisture followed by warmth and sunshine. Fairly drained light soils are best suited for maize production.

The total area under maize is 6.2 million acres and the total annual production is about 2.12 million tons, out of which the United Provinces claim about 836,000 tons, Bihar 441,000 tons and the Punjab 405,000 tons.

The average yield of Indian maize is very low as compared with those of some other countries.

Germany	... 2,828 lbs. per acre.
Italy	... 2,079 "
Egypt	... 1,891 "
U. S. A.	... 1,579 "
Japan	... 1,392 "
China	... 1,284 "
India	... 803/ "

Fruits and Vegetables. Reliable statistics and information regarding the production of fruits and vegetables is not available because the whole industry is scattered in a most haphazard and disorganised manner. Actually a lot of fruits and vegetables are produced and consumed within Indian boundaries. A lot of fresh and canned fruit is also imported specially from U. S. A., Japan and other countries.

The most popular and common Indian fruits are mangoes, oranges, papayas, melons, guavas, figs, bananas, apples, litchis, pears, peaches, plums and cherries. Best fruit growing regions, however, are N. W. F. Province, Baluchistan, and Kashmir. Mangoes are found everywhere specially in the plains.

Canning and bottling of fruit and fruit products has been recently started in the country, mostly in the Punjab.

Very rough estimates indicate that about 3·91 million acres are used for the production of fruits and vegetables. Potatoes, onions, brinjals, cabbage and turnips, tomatoes and cauliflowers are amongst the chief vegetables.

Other Food Crops : - These including fruits and vegetables cover an area of about 6·77 million acres in British India. Fruits and vegetables have been considered before. Here condiments and spices are dealt with. They account for about 1·50 million acres in British India. Spices are chiefly grown in the extreme south of India though some varieties are cultivated everywhere. Pepper abounds mostly in Malabar, Travancore, Coorg and Bengal. Chillies thrive mostly in Madras, Bengal and Bombay ; Ginger in Malabar coast, portion of Bombay and Bengal and U P ; cardamoms in Madras, Travancore, Mysore, Coorg and Bombay. Other spices include betel-nuts, cinnamon and cloves. There is a considerable export trade in them—roughly valued at 108 lakhs of rupees per year.

Beverages :—These include tea and coffee both of whom are limited to rather small areas in the country. It is better to describe them separately.

Tea : - Out of a world total of about four million acres under tea, India claims about one million acres or one fourth of the total. It being a recent industry, Tea-plantation is limited only to a few spots which were unsuitable for primitive agriculture like the mountain slopes in the Assam hills and in the Western Ghats.

Tea is had from a small ever-green shrub. It requires a warm, moist, equable climate with a temperature running between 54° F and 80° F. It can withstand frost to a certain extent, so that it can be grown at considerable altitudes as is the case in India.

In a normal year the total output of tea in India is about 453 million pounds, out of which about 80 per cent is contributed by Bengal and Assam. The following table, gives acreage and yield figures for some tea-growing areas in the country.

Province.	area	yield
Assam	439,000 acres.	2,61,037,000 lbs.
Bengal	200,000 "	1,06,440,000 "
Madras	78,000 "	38,100,000 "
Travancore	77,000 "	35,050,000 "
Punjab	10,000 "	780,000 "
U.P.	6,000 "	1,856,000 "

The important tea-growing areas are Darjeeling and Jalpaiguri in Bengal, Nilgiris in Madras, Dehra Dun in U. P., Kangra Valley in the Punjab, the eastern slopes of Assam hills, (Surma Valley and the Assam valley), Travancore and Cochin. The industry employs about 877,000 persons who come mostly from U.P., Bihar and Orissa.

The local consumption of tea in India, though it is rapidly increasing, does not exceed 12 per cent of the total production. The rest is sent to foreign countries mostly to western Europe and U. S. A. In 1939 out of the total exports of about 350 million pounds, United Kingdom alone claimed about 300 million pounds. The present war has greatly augmented the demand for Indian tea.

India contributes about 42 per cent of the total exports of tea in the world. More than 60 percent of the total tea exports of India pass through Calcutta as it is the nearest port to the tea gardens of Assam and Bengal. Chittagong also claims 25 per cent.

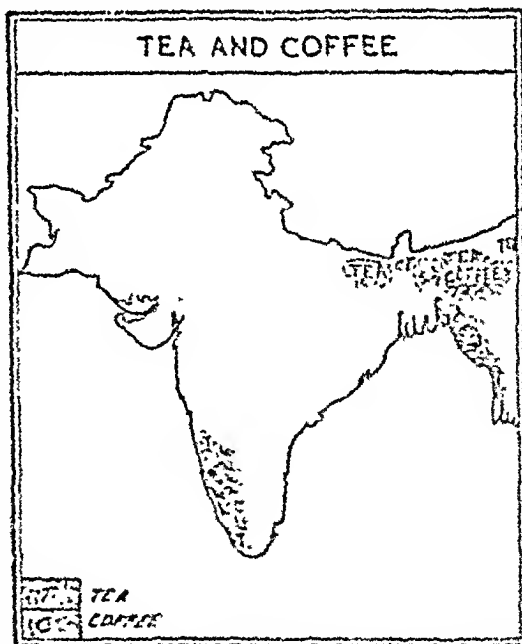


Fig. 32

Coffee. Not much is known as to how coffee production started in India. Reliable reports tell us that it started in 1830 and

reached its boom in 1862. A gradual decline developed owing largely to the appearance of some disease in the coffee plant. Brazilian coffee which is cheaper as well as better has also been responsible for this decline. The internal consumption has fallen except perhaps in South India because people like tea better.

Coffee, like tea, is a crop of warm and moist climates but unlike tea it is very susceptible to frosts. The coffee plant is usually grown under the shades of banana trees as the direct rays of the sun and strong wind are equally harmful.

The total Indian area under coffee is about 181,200 acres, a major portion of which is claimed by Mysore and Madras. The individual areas under coffee are given below.

Mysore	...	...	96,200 acres
Madras	...	...	44,600 "
Coorg	...	...	37,500 "
Cochin	...	...	1,800 "
Travancore	...	...	1,000 "

The average production is estimated at about 3.5 million pounds out of which about 1.6 million pounds are claimed by Madras and .95 million pounds by Coorg.

There are about seven thousand plantations in India, (nearly all of whom are in the south) employing a total of about 69,600 labourers. Mysore alone claims more than 4,500 plantations.

In 1939-40 the Indian coffee exports amounted to about 168,000 cwt. as compared with about 292,900 cwt. in 1930-31. Indian coffee mostly goes to the United Kingdom, France and Norway. A lot of propaganda is being done in foreign markets for Indian coffee and it is expected that the industry may be revived and our exports may considerably increase.

Manglore, Pandicherry and Calicut are the chief ports involved in the exports of coffee. About 97 per cent of the Indian exports pass through these parts. The rest go *via* Madras.

NON-FOOD CROPS

Cotton. Amongst the fibre crops raised in India, cotton is perhaps the most important. After U.S.A., India ranks the second most important cotton-growing country in the world. In an industrially developed India, cotton may be deemed much more important and useful than rice or wheat although its area is even less than one-third that of rice. Its importance is all the more enhanced as it supplies raw material to the most important manufacturing industry. It also plays a very important part in our export trade.

"The cotton plant is very sensitive to environmental stimuli, which accounts in part for the various types or forms of cotton under

cultivation in India at present." Based on geographical factors, the indigenous cottons of India may be divided into two classes :—

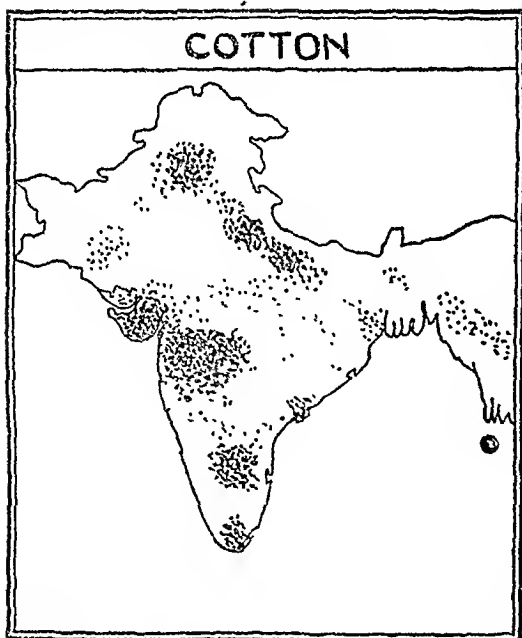


Fig. 33. 1 Dot=20,000 acres

(a) Those that mature in five months, and

(b) those that require eight months to mature.

The first variety is generally used in northern and central India, where frost usually occurs during the winter, while the second group is more suitable for frost-free regions.

Cotton is a kharif or summer crop in India, but as a rule, sown a few weeks before the break of the monsoon so that the torrents may come only when the plant is quite grown up. In this country

the cotton plant is grown under a wide range of soil conditions. But the major portion of the crop is grown in the Indo-Gangetic alluvium and the black-cotton soils. The chief producing areas are :—

Bombay	...	3.50	million acres
C. P. and Berar	...	3.33	" "
Hyderabad	...	3.19	" "
Punjab	...	2.64	" "
Madras	...	2.22	" "
U. P.	...	.56	" "
Sindh	...	.97	" "
Baroda	...	.91	" "

The average yields per acre of cotton in India are very low when compared to the yields of other countries as is shown by the figures given below .—

Egypt	...	531	lb. per acre
Anglo-Egyptian Sudan	...	277	"
U. S. A.	...	264	"
India	...	89	"

The quality too is none the better. The quality of cotton fibres depends upon many factors :—

(a) The strength of the fibre,

011 A*
c1818 018 2181

(b) Fibres with many twists make the strongest yarn.

(c) Fineness of the fibre. The Indian cottons are usually coarse, only the American varieties which have been introduced in the irrigated areas are fine.

(d) Uniformity of the fibres in length.

(e) Long fibres are preferred.

(f) Bright creamy colour is the characteristic of good cottons.

(g) The "counts".* Finer the thread, greater will be the counts (80 to 400).

(h) "Nepiness". If the fibres refuse to thicken, small entanglement of the fibres are caused during ginning.

(i) "Ginning percentage" meaning the amount of lint obtained in relation to the amount of cotton fed into the gin.

Various attempts have been made to improve both the yield and the quality of cotton. Egyptian cotton totally failed in Indian conditions. Later American varieties were introduced in the northern regions. Selection was also resorted to. The chief varieties of Indian cottons now in use are Broach, Khandesh, Kumsa-Dharwar and Sindh in Bombay; Oomras in C. P. and Berar; Coconada, Kambodia, Karungani and Tinnevely in Madras; Sindh—Punjab and Punjab-American in the Punjab; Bengal in United Provinces and Comilla in Bengal.

In normal times India exports as much as about 50 per cent of the total production, specially to Japan and the United Kingdom. In 1938-39 Japan claimed about 121,100 bales out of about 2,703,000 bales exported. War has put our export figures very low owing to the loss of the Japanese and continental markets. The present local consumption by the Indian factories is about 2.6 million bales of 400 lbs. each.

Calcutta and Bombay are the two Indian ports greatly involved in the export of raw cotton from this country.

Jute. India enjoys a monopoly in the production of jute as a commercial crop and supplies the world with raw as well as manufactured items. Bengal produces about 90 per cent. of the total yield, the balance being contributed jointly by Bihar, Orissa and Assam. The whole economic life of Bengal is determined by its growth and it constitutes more than 50 per cent of the total exports from Bengal.

The monopoly of jute enjoyed by Bengal is due to the climatic and soil requirements of the crop. It requires a hot, damp climate and a very fertile soil of the deltas which is periodically renewed. After the jute plant has been cut, it is subjected to a process called 'Retting' which facilitates the separation of the fibre from the

*A count is the number of hanks required to weigh a pound. A hank contains 840 yards

stalk. The fibre is then stripped by hand, washed, dried, sorted and then made into bales meant for export. In 1940 the total area under jute was about 4,344,000 acres and the total production was about 12,562,000 bales. In normal years before the war about 3 209,000 bales were exported but the war has put drastic restrictions on jute exports; but on the other hand, local demand has suddenly gone up because of the great demand for sand bags.

Bengal alone possesses about 3,607,000 acres, Bihar 282,000 acres and Orissa about 28,000 acres; Cooch Berar has 46,000 acres and Tripura 18,000 acres. Some jute

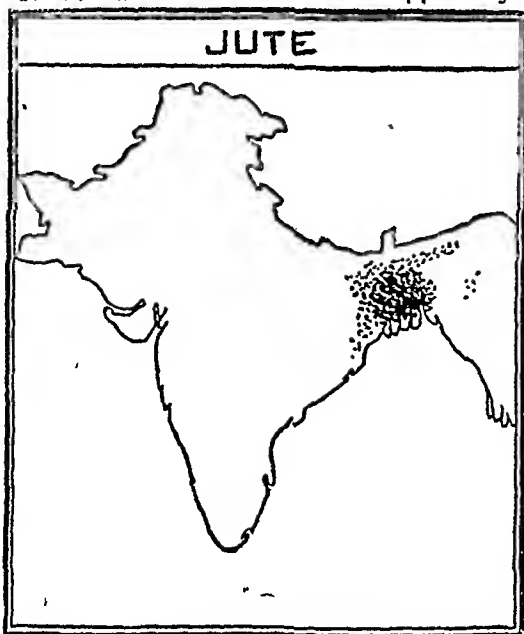


Fig. 34

has recently been grown in U. P. In Bengal the main jute-zone comprises of the district of Tipperah, Dacca, Faridhpur, Pabna, Bagra, Rangpur and Rajshahi. The district of Mymensingh accounts for about 50 per cent of the total jute production of Bengal. Purnea district in Bihar claims nearly the total jute area in Bihar. In Assam Sylhet and Brahmaputra valley are important. Cuttack in Orissa enjoys the monopoly of jute production in Orissa.



Fig. 35

Owing to the introduction of many substitutes in many of the foreign countries and owing to the over-production of jute, Bengal faced a crisis and the price of jute fell down tremendously. To look into the problem, a Jute Enquiry Committee was appointed in 1934. A voluntary restriction on jute area was imposed in 1935 and the Government advised people to grow more

rice. But in 1940 things changed and the demand for jute went up and the prices too went up.

The following table shows the average export figures:—

United Kingdom	...	...	930,000	bales
Germany	...	...	851,000	"
U. S. A.	...	...	445,000	"
France	...	...	421,000	"
Spain	...	...	285,000	"
Italy	...	...	275,000	"

Nearly all of our jute exports pass through Calcutta and Chittagong. Silk. Silk is not an Indian product but it was imported from China. Mysore which now accounts for about two thirds of the total silk area, began its silk plantation in the days of Tippu Sultan.

Silk is the fibre spun by the caterpillar of the silk-worm moth. It is famous for its fineness and for the length of its staple. The silk-worm feeds on mulberry leaves. Usually it is kept under cover and fed on leaves stripped from the trees.

The climatic requirements of the silk-worm are very flexible with the minimum temperature limit of 60°F. during April when rearing usually begins. Its labour requirements are also important.

Besides Mysore there are certain other districts which are equally important for the production of silk: (a) Murshidabad, Malda, Rajshahi and Birbhum districts in Bengal, (b) Kashmir (c) Dehra Dun and Partabgarh in the United Provinces. Insignificant quantities are also grown in portions of Bihar, Orissa, C. P. and the Punjab. In the early days of the British rule, silk and silk goods formed an important article of export. Then it degenerated into a dying industry owing to disease and foreign competition. Signs of revival are, however, again in evidence, so much so that silk and silk goods worth Rs. 513 lakhs were exported in 1940-41.

Hemp. Three varieties of Hems, i.e., sisal, sann and the Indian hemp are usually known in this country. Sann hemp, however, is the most exploited. Large quantities of this variety are sent out to the United Kingdom, Italy, France, Germany and Belgium. The sisal type is the least important and its acreage is rather small. The Indian hemp,

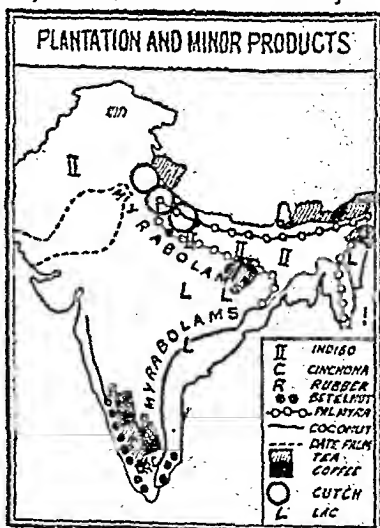


Fig. 36. (Reproduced from Hindustan Times)

is not very important as a fibre but it is used in the form of Ganja, Charas, and Bhang.

Sann hemp is largely grown in the Bombay Presidency, the United Provinces and the Central Provinces. Sisal Hemp is important in Sylhet, Tirhoot, Bombay and South India. The Indian Hemp is more important in Nepal, Simla, Kashmir, Kumaon and Kangra areas and also in portions of Sindh.

Rubber. Plantation of rubber is of recent development in India. In 1914 the total Indian output of rubber was about 50 tons. In 1931 it rose to 10,000 tons and in 1940 the figures were 12,000.

Rubber is mainly grown in Madras and Travancore, Coorg and the Mysore State. In 1939-40 the total area under rubber was about 134,000 acres. With the going away of Malaya and Burma, Allies had to depend on Indian production and naturally great steps have been taken towards its development.

Tobacco. Tobacco is an important commercial crop grown by the Indian cultivator. The country has a good export trade in this particular commodity but a large proportion of the total output is consumed locally.

Tobacco was first introduced into India by the Portuguese more than 300 years ago, and soon after, its cultivation extended rapidly. India is to-day the second largest producer of tobacco in the world. At present the total acreage under this crop is more than a million and a quarter acres, with a production of over a thousand million pounds.

Soils are an important consideration in the cultivation of tobacco and before we come to the actual distribution of the crop in India it may be better to study this question. Sufficiently open soils allowing for rapid root development are best suited. A typical tobacco soil is the one that is relatively poor in humus but has fair quantities of ingredients like potash, phosphoric acid and iron. In spite of these requirements, however, tobacco is grown all over

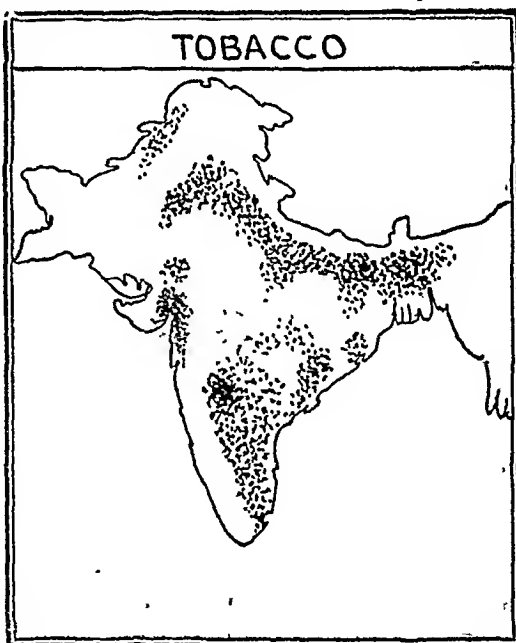


Fig. 37. 1 Dot=2,000 acres

India. The centres of cultivation are in Bengal, Madras, Bombay, Bihar, U. P. and the Punjab, the Guntur district of Madras and the Rangpur district of Bengal. The following table gives the provincial figures :—

Bengal	...	...	313,000	acres
Madras	...	...	294,000	"
Bombay	...	...	170,000	"
Bihar	...	...	125,000	"
U. P.	...	...	88,000	"
Punjab	...	...	71,000	"
Hyderabad	...	...	63,000	"
Baroda	...	...	53,000	"

About 57.6 million tons of tobacco are exported in a normal year, half of which go to the United Kingdom, China being a high second. The quality of our tobacco, however, is poor and large quantities of superior tobacco are imported into the country every year. Besides, huge quantities of manufactured goods like cigarettes, cigar and the like are also imported. There is ample scope for improvement in the quality of the Indian tobacco and with it the industry is bound to go forward.

The tobacco industry is as yet only an undeveloped affair in the country, there being only about 300 small factories employing about 1,000 workers. Beedis are made all over. The greatest need of the industry remains the cultivation of superior type of tobacco leaf.

Oil seeds :—The chief oilseeds grown in the country are, (1) Linseed, (2) cottonseed, (3) groundnut, (4) rape and mustard seeds, (5) castor seeds and (6) sesamum seed.

All the oilseeds taken together cover about 5 per cent of the total cultivated area in the country. There is a large export trade in them. In 1940-41, oil seeds worth about Rs. 10 crores were exported. The exports chiefly go to Britain and the continental countries in Europe. Groundnuts and groundnut oil are the main items of export. The oil-crushing industry is as yet not so well developed in the country. Strenuous efforts are needed to develop the oil-making industry.

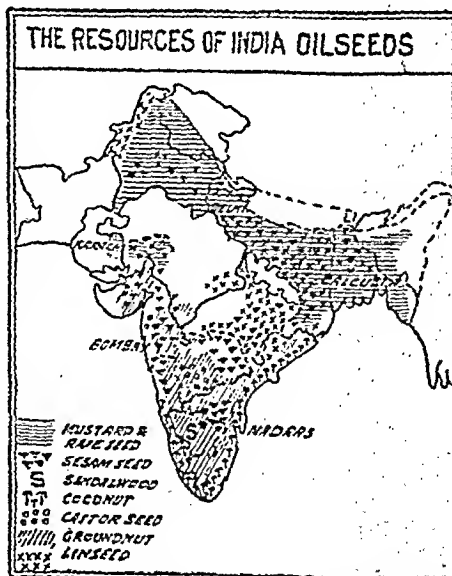


Fig. 38. (Reproduced from Hindustan Times)

(a) Linseed is one of those crops whose development is mainly determined by the export market. In 1939-40, India produced about 467,000 tons of linseed and exported 219,000 tons. The largest acreage of linseed in India is in Central Provinces and Berar, United Provinces, Bihar and Hyderabad. The individual acreages are given below :—

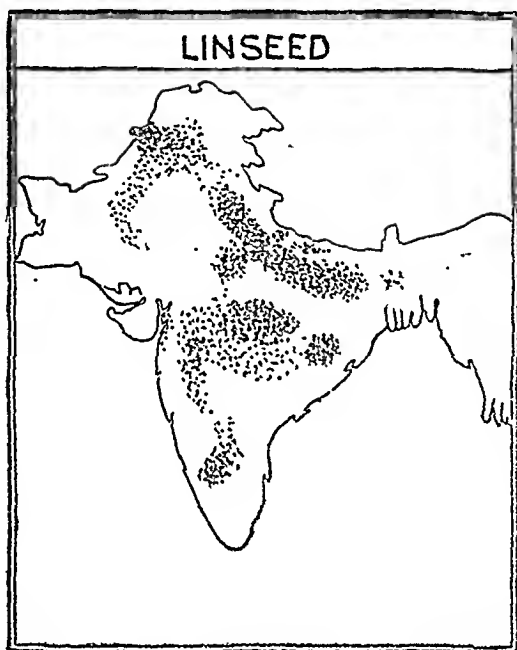


Fig. 39

C. P. and Berar	...	1316,000	acres.
United Provinces	...	948,000	"
Bihar	...	587,000	"
Hyderabad	...	471,000	"

(b) Groundnuts. Out of a world total of 67,000,000 quintals in 1940, India produced about 35,287,000 quintals. The present area under groundnuts is about 8,000,000 acres. In the early years of this century the total area was only about 410,000 acres. This huge increase is due to the increase in demand for oils. Individual averages are given below :—

Madras	3,835,000 acres.
Bombay	2,600,000 "
Hyderabad	1,500,000 "
C. P.	275,000 "

The greater part of the Indian production has an internal market, and roughly only about a quarter of our annual production is exported.

(c) Rape and Mustard have a total area of about 3·5 million acres in India. This, however, does not include 2·5 million acres of mixed cropping in United Provinces. The total yield is about 1·1 million tons. The chief producers are the United Provinces, the Punjab and Bengal. The rape-seed is mainly exported to Britain, Italy, Belgium and France. A bulk of this export trade goes via Karachi in Sindh.

(d) Cotton-seed is very important in India for the simple reason that she produces a lot of cotton. In 1940, India produced about 24,500,000 quintals of cotton-seed. A major portion of this production is consumed locally as cattle-fodder.

(e) Castor-seed forms a valuable part of our exports. In normal years about 94,000 tons of castor-seed are produced, out of which about 40,000 tons are exported. Both the figures show a decrease, but the decrease in exports is very sharp which probably means that we are using more and more of our castor-seed production. United Kingdom, France and Netherlands are our best customers. Castor cakes which are used as a useful manure, are exported chiefly to Ceylon which country takes about a thousand tons every year.

(f) Sesamum-seeds are the same as til. They also occupy an important position as an item of export. Our exports have, however, greatly gone down because of the fact that in many countries other vegetable oils such as cocoanut and groundnut have replaced sesamum oil.

About one-fourth of the world total of sesamum is produced in India. The chief regions involved in its production are Bombay, Madras and the Central Provinces.

Opium. Opium is now an unimportant crop and its acreage has for the last thirty, forty years been on the decrease. The 1939-40 figures—7,138 acres, show a tremendous decrease from 1905-7 figures 614,878 acres. The cultivation of the opium plant—Poppy—is done under a system of Government licences. The chief regions are in U. P. (about 5,834 acres) and the Punjab (about 1,304 acres).

Cinchona is largely grown on Government cinchona plantations in the Nilgiris and around Darjeeling. The area is very small but efforts are now afoot for planting more cinchona trees in India.

Fodder crops. Fodder crops occupy an area of about 10·47 million acres. Punjab, Bombay and the United Provinces claim a greater portion of this acreage (Punjab 5·04 million acres; Bombay 2·37 million acres and U.P. 1·63 million acres). These figures show a tremendous increase over the figures for 1901-2 (2·94 million acres.) This rapid increase is due to the greater demand for fodder crops owing to the increase in the number of cattle and owing to the great development in the Dairy industry in the country.

Most of the fodder crops fall into two natural groups. (a) The Legumes and (b) the grasses. Amongst the more important legumes are guara, lucerne and clovers ; while amongst the grasses more important varieties are Dub, Elephant grass and Guinea grass.

SOME PROBLEMS OF THE LAND

A minute study of the foregoing pages about agriculture in India brings home the fact that the yields are low, the quality is poor and that there is a great need for improvement all round. The reasons may be briefly described below :—

1. **Soil deterioration** is the main problem. This means that the soil is getting exhausted because of intense strain and lack of manure: Manuring problem, therefore, requires our immediate attention. Greater use of dung as manure is needed. Artificial fertilizers like the neem and castor cakes need greater popularity. More and more fallow and *banjor* tracts need reclaiming.

2. **Soil erosion** is a great menace to our agriculture. The term simply means the weathering away of the upper layers of soil by running water, wind and human and animal agencies. It is a direct result of deforestation, a policy which was being commonly followed in India not long ago. Sheet erosion is common throughout India except in lands irrigated by canals and wells and is more serious in sloping land. Deeply gullied headlands are to be seen in many parts of India wherever the level of the land surface is at all high above the bed level of the nearby river. The Jumna basin provides some of the finest examples of gullied or ravine formations. The presence of *kankar* on the banks of the Jumna and the Chambal proves to us the violent erosion that seems to have taken place during the last few decades. It is estimated that the total erosion of the Jumna-Chambal basin is equivalent to the removal of one-half ton of soil per second for the last 1000 years. In the northern areas specially around Attack and Cambellpur and along Delhi-Lahore line, wind erosion is much more marked. The harmful effects of soil erosion are, (a) gradual removal of the upper layers of soil, (b) gradual decrease in yields, (c) pasture lands gradually lose their capacity to support livestock, (d) large quantities of sands and rock material are dumped into river beds thus raising the river-beds, (e) owing to the coming to the surface of hard rock material, percolation of rain-water gets less and the water-table is apt to shrink.

The problem is being tackled by means of two channels, firstly, the reclamation of usar lands and secondly, the protection of the areas of probable damage. The cure* of this dangerous disease lies mainly in the restoration of the vegetation so as to protect the soil from the action of the denuding agents. This can be secured by

* As suggested by Sir Harold Glover in his "Soil Erosion" (Oxford Pamphlet No. 23.)

caste and every caste has its own customs which it compels its members to obey. The higher caste must not work in the fields and their ladies must observe purdah. This increases their expenses, for they have to employ agricultural labour, while their income remains the same. A marriage in the high caste, must be full of expensive ceremonies. The father of the girl may beg, borrow or steal but he must offer costly ornaments *plus* some cash to the father of the bridegroom; and a father spends most lavishly on these occasions as what he spends now determines the value of his daughter in the house of her father-in-law and a big dowry ensures the future comfort of the bride. There are many other occasions when money must be spent lavishly—at birth or death and even after death, *sirdah*. Then there comes the matter of ancestral debt. A son inherits along with other things, his father's debt who at his own turn inherited it from his father. A Hindu son is forced by religious laws to repay the debt of his father as not to pay a debt is a sin. Individuals may change but debt remains—ever passing from father to son. At least 14% of the total debt in our country is ancestral debt. Hospitality is almost a religious duty on an Indian and guests are always forthcoming. The major portion of the debt is not agricultural at all; "if one could ignore it, agricultural indebtedness would be a matter of lesser importance."

Apart from social and other unproductive expenditure, the most common objects of the cultivator's borrowings are, (1) the purchase of seed, cattle and the payment of agricultural labour, (2) the purchase of food, cloth and other articles of domestic use, and (3) the payment of land revenue and rent. A farmer seldom borrows money for effecting any improvement. The best means of realizing the importance of these borrowings is to follow the farmer round his agricultural year.

Before the break of the Monsoon in June, he has to get his ploughing gear ready. If he has sold his cattle he must buy fresh ones and for this he has to borrow or he may purchase them on instalment system. Then up to the end of September he is not in any need to borrow. Only if he has not got sufficient food left over from the winter crops, he may borrow a little, but this seldom happens.

From mid-September to mid-November is a period of heavy borrowings, for during this period the summer crops are being harvested and fields are being prepared for *rabi* (winter) crops.

After the sowing of the *rabi* (winter) crops his expenses are heavy again. He has either to carry his sugar-cane to the sugar factories or crush them locally and both the items require money and he has to water his fields at least twice. Usually he has to borrow again for food by the end of January when his food left over from the summer crops is nearing exhaustion.

Harvesting of the winter crops usually begins by the middle of March and continues till the second week of May. During this period

he has to borrow but not for agricultural items. This is the marriage seasons and he must borrow to finance the wedding of one of his children. He sells his winter produce and pays part of his debt, revenue and rent.

The gloomiest spot in the whole span of agricultural indebtedness is the money-lender locally called the "*Bania*", and the various malpractices that he follows. The ignorant farmer is a prey of the money-lender's extortionate rates of interest which is as high as six percent per month, and his illegal use of documents. Very often the money-lender takes back his money in kind. As the price of cattle is comparatively high, the cultivator likes most to pay his debt by means of cattle. The common saying is "*dangar must brabar*" (cattle are equal to grass). Pawning is also taken resort to. The worst part of the money-lender is his bad treatment towards his debtors and his mean nature. His only profession is money-lending and he lives on the interest that he gets from his debtors. A farmer once in debt is always in debt.

The Government has tried to help the farmer financially by means of remission in revenue and rent, loans and by the introduction of co-operative credit societies.

Many enquiries have been made towards finding out remedies for the menacing poverty of the farmer. The results of those made in the Punjab are significant :

(a) The modern system of farming and the use of better seeds and manures is much more remunerative. According to the usual primitive methods an acre yields about Rs. 40-6-0 while an acres used in modern style yields more than Rs. 87*.

(b) Growing of fruit and vegetable crops is to be encouraged—the income from these being five times more than that from ordinary agricultural crops.

(c) Intensive farming to be pursued as it yields larger incomes.

(d) Cottage and allied agricultural industries be encouraged.

6. Illiteracy. Much more important than the financial problem and the introduction of improved methods is the question of educating the farmer. The conditions as they exist are disgusting. Only about 7% of the total population knows how to read or write their own language. The percentage of those who know English is lower still. With this low standard of literacy in the country we can hardly expect any rapid progress in any direction. The Royal Commission of Agriculture emphasised that the Government Departments should make an effort to improve the village conditions. The idea has been partially taken up by the Government. It has made a generous start for this work by making primary education compulsory for all children below 14 years of age.

*An acre in England yields Rs. 225 and in Canada 270 rupees.

Far more important than giving the villager a general education is to give him an agricultural education which may be profitable for him and for the country as a whole. In our country we hardly have a dozen institutions that impart agricultural education. But these institutions are hardly sufficient for the ever-growing population of our country. One more defect that confronts us is that after getting all the education in agricultural subjects, a student never goes back to his village but begins hunting for jobs. The students after getting education should go back to the villages and do their own farming on improved lines. They can prove instrumental in bringing about a general agricultural development in their own villages. We, therefore, want more educational institutions to teach agricultural subjects. An effort should be made to induce the qualified student to do his own farming in his own village and thus impress on his fellow villagers by practice and not by theory alone the utility of the new methods.

7. Farm Management Much more important than adopting the modern methods of agriculture is the secret of successful and efficient management of the farms. Mostly the farmers are not thoughtful of what is good for them. What is meant in this section is that if the farmer manages his fields carefully and on sound lines and carries out either his own local practices or the improved methods, he can have much better results than by careless farming, which involves a lot of waste.

Sound management consists of, (1) selection of the most profitable cropping schemes, (2) economy in expenditure, (3) conservation of water and manure, (4) the correct use of the implements, (5) the proper care of cattle and other motive power on the farm, (6) and the utilisation of free periods.

The farmer should chalk out the programme of the crops that he will grow during the winter and hot weather seasons. Before actually growing a crop a farmer should consider all the resources that he has for crop production. He should draw an approximate budget of his income and expenditure and should keep accounts of both goings and comings. He should see that no extravagance is done either in his agricultural expenses or non-agricultural expenses. The farmer should know the correct use of his agricultural implements. He must know how many ploughings are necessary for different crops. He must also know what sort of temperature and water conditions are good for the cultivation of various crops. He should never forget that cattle are his chief source of power and they should be kept healthy if efficient work is expected of them. The farmer can supplement his income by following some cottage industries in his spare time. Mixed farming should be encouraged and industries like poultry-keeping, basket making, spinning and shoe-making. Speaking of shoe-making, the demand for shoes is so general that followed any one without a shoe is considered mean. By making durable and

cheap shoes for themselves, their neighbours, their friends and their relations, in their off time, the farmers can add to their income from the fields. The Government has arranged special facilities in awarding scholarships and stipends to the villagers to learn this industry and for this purpose schools have been opened

CHAPTER VI

LIVESTOCK WEALTH OF INDIA*

Livestock is a great potential wealth to any nation, specially to India where agriculture is the main occupation of more than 75 per cent of the people. Cattle may be called the backbone of the Indian agriculture so much so that the farmer counts his cattle as a part of his property. In all the agricultural processes from ploughing up to harvesting, cattle form the agricultural power.

India claims about one third of the total cattle of the world and thus holds the first position in this matter. Her position in the matter of camel, donkey and sheep populations is second, third and fourth, respectively. The facts briefly discussed below show the tremendous importance of livestock.

Cattle. We have about 16·7 crore oxen and about 5 crore buffaloes. These figures represent more than 70 per cent of the total in Asia. India, however, occupies a low position in the international cattle trade. We have about 35 well-defined breeds of oxen and about 10 of buffaloes. A greater percentage of the cattle is found in the northern lowlands.

It is very difficult to place a definite financial value on cattle labour. Some enquiries in this direction have been made in a few Punjab districts and it is estimated that about 15 to 20 per cent of the cost of cultivation falls under this head. The upkeep of a pair of bullocks requires about Rs. 175 per year. An average pair of bullocks prepares about 10 acres of land in a year. Working on this basis the cost of cattle labour comes to about 525 crores of rupees. Cattle manure is another factor that must be taken into consideration. The value of this is not easy to be assessed. Rough estimates, however, indicate that about rupees 220 crore worth of cattle manure is used yearly. No estimates are known of the dung cakes used as fuel. In idle season, bullocks also supply a good means of transport. The marketing department of the Government of India has estimated that "the contribution of the cattle in the economy of India is estimated to be Rs. 1,900 crores annually.†

The efficient running of agriculture is hardly possible without efficiency of the cattle. Low vitality and high mortality are rampant amongst our agricultural cattle. Many of the agricultural cattle about 95 per cent of whom are bullocks, are small-sized, ill-fed and inefficient. One great defect is that no difference is made between agricultural and draught cattle. The question of breeding and

* A census of livestock is taken every five years. The last was taken in 1940. But upto now no census has covered the whole of the country.

† The Indian Veterinary Journal Sept. 1944 pp. 87—90.

veterinary arrangements are now being attended to in most of the provinces where separate departments and research stations are devoted solely to this kind of work.

The fodder problem is another item to be tackled. The production of fodder crops is very small. There are only 85,000 sq. miles of grazing grounds in India. A detailed study of U. P. has been made by one of the authors (V. S. Mathur). The results are given here as what is true of U. P., is true of the whole country. The highest percentage of fodder crops is 20 per cent of the total agricultural area and there are places where no fodder crops are grown at all. The number of acres per 1,000 animals is generally low, the average being about 50 acres per thousand animals. Silage making is at many places recognized as a suitable means of converting a part of the produce of green fodder crops into a form in which it can be stored for use during the dry weather when it is most needed. Many barren spots are being reclaimed for producing fodder.

Goats There are about 38 million goats in British India.* This figure covers more than one fourth of the world population. The annual exports of these animals is estimated at 26 thousands, imports being very small.

Only 15 percent of the goats are milked, the average annual yield being about 200 pounds per goat per annum. Goats supply about 8 per cent of the total Indian milk production of 22.1 million tons per year.† Mutton, wool, hair, skins and bones and manure are other items supplied by goats.

Sheep. With 509 lakh heads, India stands fourth in the world's sheep production. There are about 30 breeds of sheep found in this country. Indian exports of sheep are estimated at about 10 thousand heads.

Poultry. It is estimated that there are 74 million fowls and 11 million ducks in British India. Combined with geese, turkeys and guinea-fowls, the total comes to about 19.08 crores. The percentage of desi fowls and ducks to the total buying birds comes to 88.3 and 9.4, respectively.

Horses, mules, donkeys, etc. India has about 22.24 lakh horses and 76 thousand mules. The number of donkeys and camels comes to about 19.38 lakhs and 9.93 lakhs, respectively. India possesses about 27.77 lakh heads of swine.

There is practically no export[†] trade in these animals. In 1939-40 about 2,100 horses were imported.

Fish. The fishery resources of India may be classed as (a)

• 618.5 lakhs in the whole country.

† Masani, Our Food—p. 42.

‡ U. P., Orissa and some states did not take part in 1940 census.

marine and (b) inland. The marine catch is estimated at 450,000 tons a year and inland catch is reported to be about 220,000 tons a year.* The chief Indian marine fisheries include the coastal areas of Sind, Gujrat, Konkan, North and South Kanara, Malabar, the Gulf of Manar, the Coromandel coast, the Telegu area and the deltaic areas on the eastern coast of India. The inland fisheries† include the Gangetic and the Indus systems of rivers.

The Indian consumption of fish is also quite large. The residents of Bengal, Bihar and Orissa perhaps consume more fish than the rest of the country put together. Bengal alone consumes more than 40 million maunds per year.

In Bengal alone the dry season fisheries extend to more than 8,000 square miles—a figure that is excelled only by U.S.A. and Canada.

Madras is very favourably situated as to her sea fisheries, but at present the fishing activities are limited to within 3 miles of the coast. If properly handled, Madras can have a fishing area of about 45,000 square miles. Manufacture of Fish oil is carried on widely in the province and there are about 300 such factories.

Orissa is an other province which has a rich seaboard and contains fishing grounds extending to over 30,000 square miles—all of which, however, have not yet been developed owing perhaps to defective means of communications. A lot of fishing activity is in evidence in the Chilka lake. Orissa exports a great portion of its catch. The neighbouring province of Bihar also exports an equal amount. The exports for Orissa average 75,000 maunds per annum.

Bombay fisheries are mostly shallow-sea fisheries. The greatest advantage there is the presence of a number of small harbours which provide good shelter to fishing craft. A lot of fish canning is carried on in Bombay proper. There are two pearl fisheries in the Gulf of Cutch.

Sindh has quite a rich sea fishery. In 1940-41 she exported‡ about 62,870 cwts of dried fish to Hong Kong, Singapore, Malaya, Ceylon and South Africa, besides sending about 26.5 thousand maunds to the Punjab, and other up-country places.

In U. P., Punjab, C. P. etc. fishing is carried on in the rivers, lakes and other water bodies.

Amongst the Indian states, the fisheries of Travancore, Baroda, Hyderabad and Mysore deserve mention.

India produces about 10,000 tons of fish oil every year. The chief centres of supply are Madras (west coast and Canara). There are practically no imports of raw fish into India. About 16 lakh rupees worth of preserved fish are, however, imported. The average per capita consumption of fish in India is estimated at 3.4 lbs per annum.

* This figure gives the amount of inland fish marketed.

† Or river and lake fisheries.

‡ The Indian Year Book—1943—44 pp. 607.

It is generally believed that with proper attention and adequate arrangements the total production of fish may tremendously increase. The greatest need is to bring about a system of discriminate fishing. No particular attention has ever been paid to this problem from any quarter. It is only about three years ago that a Fish Committee was set up by the Imperial Council of Agricultural Research. Some useful activity is now in evidence. The future of the industry seems bright.

LIVESTOCK PRODUCTS

Milk and Milk Products.—The total production of milk in India is about 22.1 million tons, half of which is supplied by buffaloes, 47 per cent by cows and the remaining 3 per cent by goats. But actually 18.8 million tons is left for human consumption. Taking facts as they are about 28 per cent is consumed in the fluid form; 57 per cent is converted into ghee, 5.2 per cent and 5 per cent is taken in the form of curd and khoa, respectively. Out of the rest 1.7 per cent is made into butter, 0.4 per cent into cream, 0.3 per cent into ice cream etc., the balance of 2.4 per cent is made into rabri, malai, and Khurchan.*

The average per capita consumption of milk is about 5.8 oz.† per day. When compared to the average per capita consumption of some other countries, India lies disappointingly low.

Canada.....	55.5 ozs	Britain.....	40.5 ozs.
New Zealand.....	55.2 „	Denmark.....	40 „†
Finland.....	55 „	U.S.A.....	35.5 „
Australia.....	45 „	Germany....	35 „

Meat—Roughly speaking the total supply of meat in India is about one million tons. According to the estimates by Col. Sir Arthur Oliver the total value of meat produced in India is about 20 crores of rupees (pre-war). The term meat includes mutton, pork and beef. There is no export trade in meat. It is usually consumed fresh locally.

Bones.—The gross annual production of bones is about 10.28 lakh tons; out of this about 7.13 lakh tons remain uncollected. India exports about Rs. 32 lakhs worth of bones and bone meal chiefly to Ceylon, United Kingdom and Belgium.

Blood meal is another by-product of meat. It is used as a manure. According to Mr. Kali Charan Ghosh India exports about 700 tons per annum.

Wool.—The total annual production of wool is reported to be about 8 crore pounds valued at Rs. 5 crores, but the annual

*including milk products.

†Economic resources of India, page 15.

‡The United Nations Conference on Food and Nutrition recommends 21 ozs. of milk per man per day.

net available supplies come to about 4 crore lbs. There are white as well as coloured varieties of wool. On the whole the Indian wool is of a low and rough quality fit mostly for blankets and rough cloth. The internal consumption of wool is very low in India owing to the climatic conditions prevailing in the country. The yield per sheep is also very low, about two pounds per annum, as compared to the yield of Australian sheep. The chief wool-producing provinces are the Punjab, N.W.F.P., and United Provinces. In 1939-40 about 5 crore pounds of wool was exported and the imports amounted to about seventy seven lakh pounds. Our imports* come from Afghanistan, Persia, Australia and United Kingdom. A good percentage of the wool imported into India is dead wool as it has been removed from the carcasses of dead and slaughtered sheep.

Hides and skins.—India produces about 2.57 crore goat skins and 1.71 crore sheep skins. These figures represent about 18.8 p.c. of the world total of hides and 18.9 p.c. of the world production of skins. She exports about Rs 435 crore worth of raw hides and finished leather and 5.79 crore worth of skins annually. India claims an important position in the skin trade and her share is about 23 per cent of the skins marketed in the countries of the world. Rs. 24 lakh worth of hides and unwrought leather are imported into India.

CHAPTER VII.

IRRIGATION IN INDIA†

It is only the people who live in drier regions or in places that receive only seasonal rainfall, who appreciate the importance of irrigation. The rainfall in India is sporadic in character and there are places where agriculture is possible only with the help of artificial irrigation. The importance and the utility of irrigation, however, depends on the local rainfall conditions of places. In the chapter on climate, we have already learnt the nature and extent of rainfall regions. Here it is only necessary to refer to this point only briefly to realize the full extent of the problem. The coastal plains of the southwest receive over 80" of rainfall while the slopes of the western ghats receive varying quantities from forty to eighty inches. Beyond the ghats there lies a big area where the rainfall varies from twenty to forty inches, the annual variability being marked. In the Deccan this region extends almost to the eastern coast. It goes northward into the western part of the Great Plain, form-

*including woollen goods.

†Prof. George Kurjian's paper on "Irrigation in India" published in Madras University Journal in 1943 has been freely used in the body of this chapter.

ing quite a broad belt about the eastern side of the Thar Desert in Rajputana. In the north-west there is a general lack of rainfall.

For increasing agricultural production, the greatest need in most areas of the country is water. It must be applied at the right time and in the right quantity. The vagaries of the Indian monsoon are practically beyond human control. Water has, therefore, to be supplied to the fields somehow. At places rainwater is conserved in tanks and used at times of need. Where the sub-soil water-level is high, the underground water is supplied by means of wells. The water of the surface streams is also headed up and canals taken off them for irrigational purposes.

In 1940-41 out of about 261.9 million acres of land under cultivation about 85.8 million acres were irrigated as under :—

30 million acres by canals.

13 million acres by wells.

6 million acres by tanks.

6 million acres by other sources

It is very seldom realised that the acreage irrigated in India exceeds the combined total of that in the six countries which stand next to her in the list of the world's largest irrigation countries, including United States. The quantity of irrigation water used is about 260,000,000 gallons equal to the winter flow of 100 rivers of the size of the Thames in England. The Sukkur Barrage in Sindh commands an area double that of Palestine. The Sarda canal is the longest system in the world. There are 240 irrigation schemes of all kinds in the country,

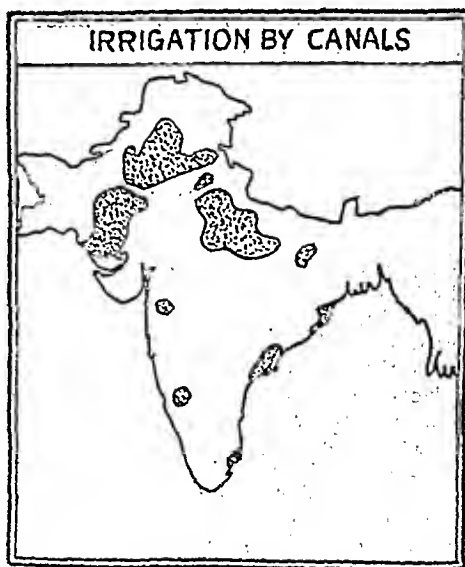


Fig. 40

of which 61 are of a major description. The following table *shows the individual position of the various provinces with regard to area irrigated. The Punjab is particularly a land of irrigation; Sindh, Madras and U.P. are other places of importance :—

*The Indian Year Book 1943-44, p. 315.

<i>Province</i>	<i>Area Sown ' (Acres.)</i>	<i>Percentage of area irrigated</i>
Madras	36,917,900	20.49.
Bombay	28,591,100	1.71.
Bengal	29,719,600	0.81.
U.P.	35,542,100	14.53
Punjab	31,572,603	38.80
Bihar	19,323,400	3.40
Sindh	5,441,300	89.12
C. P.	20,658,000	1.50

(1) **Wells:** About 5 per cent of the land cultivated in British India is irrigated by wells. The term 'well' includes all such works where the water has to be lifted up before it can be used for irrigation. The wells used include fissure wells in rock, spring wells and even percolation wells.... "Wells vary greatly in construction and capacity. They may be mere holes in the ground, or elaborate masonry structures of great width and considerable depth, or tubes of small base, from which by power pumping large supplies of water can be obtained continuously through the year."*

Broadly speaking, however, there are only two main types of wells *i.e.*, (1) Pukka wells which cost much more on construction and which only more well-to-do farmers can use and (2) the kaccha wells which are simply holes dug in the ground. Such kacchawells are more common in areas like U.P. where the sub-soil water level is higher and where the upper soils are soft thus facilitating the digging. A kaccha well can hardly irrigate more than 3 acres situated in the immediate vicinity. The pukka well (which is a permanent feature) may be able to irrigate 10 to 23 acres in flat lands like the Punjab and U. P., while in regions of rough topography, the areas come down considerably.



Fig. 41

There are a number of methods of lifting water from wells. They are, usually worked by animal power, but poorer class of peasants work their wells themselves. The common and the cheapest instrument is *Dhenkli* which is simply a long pole balanced on a mud well. A bucket is attached to one end of the pole with a string. This is worked by the farmer himself or his wife as the case may be. The quantity thus got, however, is small and it can irrigate only a small area around the well. The Persian wheel is a modification of the old chain system. A chain of buckets is hung in the well and a wheel attached to it. Bullocks are yoked to the wheels and as the bullocks walk around, the chain goes in and out of the well and there is a regular flow of water. As an improvement two chains are used instead of one. This gives more water. A big leather bag worked by bullocks or by men is also used for drawing water out of a well. Well water is usually costly as it has to be lifted, and is used mostly for high grade crops.

The following table taken from "Irrigation in India" (1937-38 page 3) shows the importance of wells as a source of water supply for irrigation in this country.

WELL IRRIGATION

Province	No. of wells in use	Area irrigated
U. P.	11,33,442	53,03,700 acres
Madras	6,46,566	14,44,600 "
Punjab	3,32,182	43,46,200 "
Bombay	2,90,030	6,98,900 "
C. P.	1,28,982	1,22,400 "
Rajputana	19,932	59,903 "
Sindh	17,101	52,900 "
N.-W. F. P.	13,138	74,300 "

There has not been any significant increase in the area under well irrigation during the last forty years or so. For example the increase between the years 1902-1903 and 1937-38 was only from 11.6 million acres to 12.7 million acres. According to the agricultural commission of 1926 (para 274) "there is no province in India in which well irrigation might not be largely extended with advantage."

TUBE-WELLS*

Utilizing the under-ground water by means of tube-wells worked by electric power is a valuable but quite a recent asset in the irrigation of our country. It was in the year 1912 that attention was directed in India to pumping out sub-soil water in sufficient quantities for the purposes of irrigation. Firstly, oil engines were used but they proved very expensive. The use of electricity is very recent. An average tube-well can supply water for about 200 to 300 acres and its capacity may be as much as 35,000 gallons per hour.

Tube-well irrigation is most important in western United Pro-

*Based mainly on V. S. Mathur's "Ganges Valley Tube-Well Scheme"—Indian Geographical Journal, June 1941—pp. 145-152.

vinces because here the Government has given substantial help. In other provinces there are very few tube-wells and they are mostly private-owned. Electric power generated at the canal falls on the Upper Bari Doab Canal of Amritsar has been used to pump water from tube-wells for irrigation for many years. In the Punjab power from the large Mandi Hydro-electric Scheme will probably be also used for the same purpose.*

The Western United Provinces, the area comprising the districts of Bijnor Moradabad, Budaun, Muzaffarnagar, Meerut, Bulandshahar and Aligarh (measuring about $1\frac{1}{2}$ million acres) had hitherto remained without much irrigation water for the winter crops due to the shrinkage in the rivers in the winter months. The storing of Monsoon waters in the Himalayan reservoirs was not likely to prove useful. The only alternative useful for the purpose of irrigating this area lay in the exploitation of the under-ground water. Tube-wells worked by oil engines had already proved unattractive. The only solution lay in making available electric power at a series of points throughout the area at a cheap rate. The Ganges Canal Grid scheme that was initiated in 1929 made the exploitation of that idea feasible.

Before we describe the tube-well scheme in full, it is essential to say something about the development of the Ganges Grid scheme which made it possible to develop the tube-well scheme.

GANGES CANAL GRID SCHEME†

Colonel Cautley who designed the Ganges Canal, placed on it at intervals a number of falls about 10 feet high in order to reduce the speed of the flow and thus restrict the scouring of the channel. The idea of developing electricity was gradually taking root and in the year 1913 a small power station was installed at Bahadurabad for the purpose of operating the construction of machinery at the headworks of the canal at Hardwar. The canal water supply in those days was very precarious and could not be looked upon as perennial, and was unable to serve as a permanent source of electric power. The hydro-electric survey made in 1919-20 showed that the power on the Ganges Canal falls was available only for nine months in the year, that is excluding November, December and January.

When in 1926 the possibility of giving a continuous water supply to the Ganges canal had been established by engineers, the question of generating electricity from the falls was reconsidered. This fact contributed widely to the evolution of the grid scheme. Since 1928 the grid scheme has made rapid progress. The period from 1928 to 1940 may be divided into three stages of grid development.

*Economic Problems of India—Mukerji—p. 166.

†This is a very important Hydro Electric Scheme in India.

1st Stage. (1928-31). The stage was one in which individual projects were sanctioned. The falls at Palra (8 ft.) were electrified in 1928-29. Here power was generated for pumping water from the Kalinadi to reinforce the Ganges Canal and electrify the town of Khurja. The fall at Bhola (12 feet) was used for electrifying Meerut, Hapur and Ghaziabad. Power generated here was also used for pumping water from the Ramganga at Serhara for irrigating the high arid land between Bijnor and Moradabad and also to electrify the larger towns in the above mentioned districts.

When these individual projects were carried out, it was decided to inter-connect them with a view primarily to electrify the intervening smaller towns and secondly to give more security to the supply of power.

2nd Stage. (1932-35). During this period a series of minor steps were taken towards the development of the scheme. The small power station at Sumera was built in 1931-32 on separate foundations away from the canal. The Bhola and Bahadurabad power stations were enlarged. The Grid lines were extended to Ali-garh, Hathras, Tundla, Dayal-Bagh and Kasganj. A system of rural branch lines was evolved and thus isolated farms within economic distance of the main lines were supplied with power. It was during this period that experiments proved that power could be used for pumping the water from the sub-soil in places out of the canal reach and the evolution of state tube-wells became a very important factor in the lay-out of the power lines and transforming stations.

3rd Stage. (1935 onwards). During this stage it was decided to complete the project (a) by the installation of three additional hydro-stations of Salawa, Chitaura and Miragajni, (b) to build a steam station at Chandausi to supplement the flow of the canal for generator current at the time of maximum demand and (c) to electrify the southern parts of Moradabad and Budaun districts. The stations mentioned above have commenced operations.

The present system comprises seven canal power stations of (1) Bahadurabad, (2) Miragajni, (3) Chitaura, (4) Salawa, (5) Bhola, (6) Palra and (7) Sumera, supplemented by various local oil engine stand-by plants and the steam station at Chandausi.

In the rural areas with which we are greatly concerned current is sold to a farmer at a flat rate of 1 anna per unit for agricultural purposes.

The demand for supply of cheap power in small quantities in scattered private farms has always been on the increase. A rural branch line system was introduced for this purpose; and this branch line system has been rapidly expanding. The number of consumers is about 400 at the present day, while the corresponding figures for the year 1932-33, was only 3.

In order to encourage the electrification of cottage industries it is proposed to introduce a lower rate per unit. Efforts should be directed towards development of electricity in the rural areas and an increased demand will make it possible for the authorities to reduce the price. The most important feature of the hydro-electric scheme is that when once the initial expenses have been incurred the cost of supplying additional power is negligible, and consequently the more power that is required, the cheaper it can be supplied.

TUBE-WELLS

When the first stage of the Grid Scheme was completed in 1931, many privately owned tube-wells were electrified. Many new tube-wells for irrigational purposes were erected by the Government.

An experimental canal getting its supplies from larger wells, was constructed in 1931 at Dingarpur, Moradabad district. There was incessant demand from the cultivators for a rapid expansion of the tube-well scheme. Experiments showed that the average cultivator would prefer the tube-wells and would pay for them rather than use his own bullock-operated wells. The Government decided to complete 1,500 tube-wells in three annual stages. A so-called development circle was formed and 1,518 sites were located.

The allocation of the wells to the various districts is approximately as given below (1937-38).

Division one.—East of the Ganges :

Bijnor	...	137	Tube-Wells
Moradabad	...	429	" "
Budaun	...	395	" "
		<hr/>	
		962	
		<hr/>	

Division two.—West of the Ganges :—

Muzaffarnagar	...	62	Tube-Wells.
Meerut	...	220	" "
Bulandshahar	...	154	" "
Aligarh	...	20	" "
		<hr/>	
		456	
		<hr/>	

To these must be added 44 as miscellaneous. This brings the number to 1,462. In the appended map we have tried to show the area irrigated by tube-wells in every district.

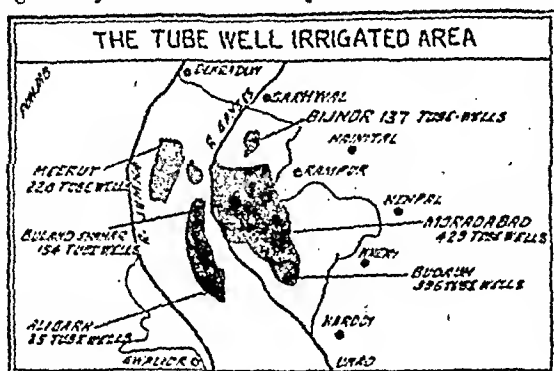


Fig. 42

Now we may study each district under the scheme separately and see how far the introduction of tube-wells has benefitted their agriculture.

Bijnor. With the exception of a small local canal, the district has remained without irrigation. Masonry wells are not feasible to run as they involve a high running expense. Double-cropping was not profitable as the winter crops, sometimes even the summer crops, had to go without water.

The 137 Tube-Wells that have been erected there command an area of about 270 square miles of the cultivated area. Further developments are very desirable.

Moradabad. Except for the area of about 100,000 acres commanded by the Ram Ganga Canal, the district has been devoid of irrigation. The 429 Tube-Wells command 840 square miles or 56% of the total cultivated area.

Budaun. Budaun has always been very unfortunate in respect of canal irrigation. Although it is surrounded by canal irrigated districts, it itself has never known the benefit of canal irrigation. 336 Tube-Wells command 810 square miles out of a total of 1,831 square miles. Tube-Wells are a boon to the district, the soil being very fertile. Further developments may be considered.

Muzaffarnagar. The Loi tract lying between the Hindan and the Kali Nadi is out of the canal range. 25 wells have been sunk in the southern part and 37 in the northern part of the area.

Meerut. It is the greatest canal irrigated tract, being commanded by the Eastern Jumna Canal, the Upper Ganges Canal and the Anupshahar branch of Upper Ganges Canal. The 220 Tube-Wells command

an area of 216 square miles of the drier parts in addition to the area irrigated by canals.

Bulandshahar. The central portion between Kali Nadi and Nim Nadi has hitherto remained without any canal irrigation. The 154 Tube-Wells command 230 square miles of cultivated land out of a total of 540 square miles.

Allgarh. The only part that has been included in the scheme is the northern portion of the tract lying between the Kali Nadi and Nim Nadi and forming a continuation of the Bulandshahar tract between the same rivers. Formerly 96 wells were proposed but only 20 have been sunk.

The State Tube-Well project commands about 2,900 square miles of country comprising some 1,462,000 acres of cultivated land and it is estimated that in times of draught, the Tube-Wells will be able to water :—

Winter crops	...	482,460	acres
Sugarcane (Summer)	...	182,750	"
Other Summer crops	...	87,720	"
	...	<u>752,930</u>	<u>acres</u>

The danger of a fall in the sub-soil water is extremely small. There has been no permanent fall in the water level of these districts where intensive pumping has been in operation for several years.

The average charges in the two zones are the following (these charges are for the whole season of one crop and not for one watering only or for the volume of water used) :—

One watering in the case of sugarcane means about 110,000 gallons per acre, while in the case of wheat and other crops it is 88,000 gallons per acre. Sugarcane requires about 5 waterings while wheat and other crops require one to two waterings. We have not taken the case of rice as no definite figures are available.

<i>Eastern zone</i>				<i>Western zone</i>			
Rs.				Rs.			
Sugarcane	...	6 13	0 per acre	Sugarcane	11	0 0	0 per acre
Other summer				Other summer			
crops	...	5 0	0 " "	crops	5	8 0	" "
Winter crops	2	0 0	" "	Winter crops	5	8 8	" "

The importance of this development will be realised when we know that out of 28,000 kilowatts for which the Ganges Canal Scheme provides, more than 12,000 kilowatts are allotted to the State Tube-Wells. The project has within its fold 3,000 miles of

distribution canals and about 1,000 miles of inspection roads along with residences, offices and other buildings.

Some Tube-Wells supply water to the Upper Ganges Canal.

Such then are the brief details of the twin schemes, the Upper Ganges Canal Hydro-Electric Grid Scheme and the State Tube-Well Scheme.

Mr. V. S. Mathur, during his enquiries, questioned many farmers as to their opinion about the utility of the Tube-Wells and not one of them uttered a word against them. They get water from Tube-Wells for all purposes which saves a lot of their time and worry. The cultivator will never grudge what he pays for water and for other facilities if he is left alone by the landlord, the moneylender and their extortionate dues. Some people have taken to criticising the rates. If somebody could criticise the action of the landlords and the money-lender, much more valuable results could be obtained. It will not be very wrong to say that most of these critics are landlords themselves and are aware of the pitiable condition the farmer exists in. They want to help him; but if they do it themselves, it means a monetary loss to them and that is why they take to criticism as the safest way of playing the role of saviours of the cultivators. As to the actual prices of power and water, it should prove that the price is controlled to a great extent by the degree of demand. The more power that is used, the cheaper it can be supplied.

There is a great need for development in tube-well irrigation specially in regions where canal irrigation is deficient. "A careful survey of the sub-soil should be made as a preliminary to construction on a large scale. The necessary tube-wells should then be constructed by the Government"*

CANAL IRRIGATION.

Canals include "all work for directing the water of the rivers and carrying them to the fields." Canals of the perennial type draw their supplies of water from rivers in all seasons of the year, while those of the *inundation* type draw only the surplus supplies during floods. Inundation canals work under precarious limitations as their work depends much on the extent and duration of floods. Perennial canals are usually classified into, (a) those that are drawn from the upper portions of the rivers as is the case with the canals of U. P. and the Punjab and, (b) those which lie in the deltas of the rivers as is the case with those of Madras and Bengal †

More than half the irrigated area is under canal irrigation. Canals now irrigate more than 30 million acres of land, a figure which shows a very impressive increase when compared to the land

*Memorandum on the Development of Agriculture and Animal Husbandry in India—p. 24.

†The number of such canals in Bengal is very small,

construction. The Bundelkhand, the East Jumna and the Agra Canals may be included amongst the latter category. Collectively speaking the United Provinces boast of 2,371 miles of main channels and 11,756 miles of distributaries (under productive works) irrigating 3·874 million acres.

(1) The Upper Ganges Canal. The canal as it has a length of 568 miles in its main channel and bigger branches, viz. (1) The Anup Shahr Branch, (It irrigates an area of 1,165,383 acres. The districts that are benefited by it are Saharanpur, Muzaffarnagar, Meerut, Bulandshahr, Aligarh, Muttra and Etah.) (2) The Mat Branch and (3) the Hathras Branch which are of comparatively recent birth; the former was constructed in the year 1912 and the latter in the year 1904-05

The Ganges at Hardwar is about a mile in breadth and is divided into separate channels by islands. One of these streams leaves the main stream some 22 miles above Hardwar and passes close to the city carrying about one third of the total volume. The canal is drawn from this channel at Mayapur. Mr Mathur visited the head works in 1937. The canal was opened on the 8th of April 1854 but it was not until the 18th of May 1855 that irrigation was commenced in the upper sections. The delay was due to the fact that the canal had to be closed to improve the aqueduct at Saloni which was still incapable of retaining a full supply. Then came the mutiny and much of the progress was hampered and it was not until the year 1861-62 that the full supply for which the canal was designed was supplied. The canal was originally designed to carry 6,750 cubic feet per second but in cases of emergency it can carry 8 000 cubic feet. The canal is 200 feet wide at its head and its depth at full supply is about 11 feet.

The rapid slope of the country during the first twenty miles of the canal necessitated the construction of waterfalls, in order to reduce the speed and thus restrict scouring of the channel. Some of these falls have now been utilised for generating electricity.

At the nineteenth milestone comes the Saloni Acqueduct, which is unquestionably the finest work on the canal. It consists of 15 arches supported on massive masonry piers which carry the canal over the Saloni river.

A good amount of remodelling was necessary before the canal could be brought to its present shape.

Special expenditure has been undertaken to facilitate navigation by constructing locked channels round the falls, and by raising bridges. Boats can pass from Roorkee to Cawnpore. Before 1926 the supply of water in the canal could not be looked upon as perennial. It was only in 1926 that the possibility of giving a continuous supply of water in the canal was established by Raja Jwala Parshad, the then chief Engineer of the United Provinces.

Our canals are subject to occasional deficiencies in water supply. Such deficiencies usually take place in the months of January and February and in some years in May and April, when cool weather delays the arrival of snow water, and sometimes in June when the monsoon is delayed.

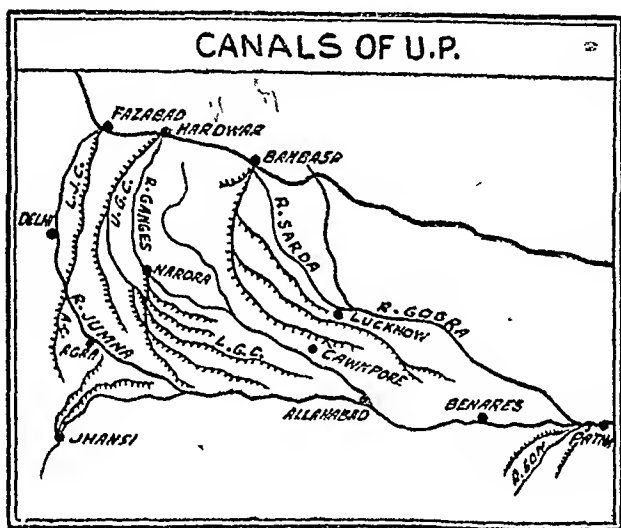


Fig. 44

To supplement this several experiments have been made. In 1934 two distributaries in the Meerut division were cut off from the Upper Ganges Canal and fed by large tube-wells. The areas locally connected were also expanded by the construction of channels, and the water thus saved has been passed on to the Mat Branch which has been correspondingly increased. A modification has been adopted on the Akbarpur distributary in Meerut. Here the five miles of channel have been abandoned and replaced by tube-wells. Both these measures are in their experimental stages to see whether the location of tube-wells on canal banks would be likely to prove a suitable source of additional water.

A second and cheaper method of supplementing the water of the Ganges Canal at times of shortage was explored in 1935. Thirty wells, which altogether pump 100 cusecs directly into the canal have been constructed. The additional water is being utilized mainly for irrigation on the Mat Branch in Muttra, Agra and Aligarh districts, where tube wells cannot profitably be constructed. These wells were officially opened by Sir Harry Haig, on the 2nd November 1937. Experiments are in progress to ascertain as to what extent the water extracted from the tube-wells is drawn in the form of additional seepage from the canal itself. Records completed up-

to-date indicate that a very small percentage of the water withdrawn from the wells is actually taken into the canals. A heavy layer intervenes between the sub-soil sands and the canal.

If the feasibility of the attempts to increase the canal supplies is established, a large scale development in this direction seems to be desirable. The immediate need of our cultivator in the Western United Provinces is water and introduction of such profitable methods should be of value.

(2) **Lower Ganges Canal.** The Committee appointed in the year 1866 to decide as to what remodelling was necessary in the Ganges (now Upper Ganges) Canal and as to what were the prospects of another being constructed in the Ganges—Jumna Doab with Narora in Aligarh district as a point from which a supplementary supply might be drawn from the Ganges. The project was not actually carried until a later date (1872), and work commenced during that year.

The canal as it is to-day (see the attached map) is 662 miles long in its main channel and bigger branches and 3,324 miles in its distributaries and the area it irrigates is 1,165,383 acres. Its main branches are, (1) Farrukhabad Branch, (2) Bewar Branch, (3) Cawnpore Branch, (4) Ettawa Branch, (5) Fatehpur Branch. The last named is an extension of the Cawnpore Branch to irrigate the districts of Fatehpur Cawnpore and Allahabad which have hitherto been without any canal irrigation. It was opened for irrigation in 1898 and it irrigates an area of 120,000 acres annually in that region. The map shows the extent of that branch and shows that much of the area in that region is still not under canal irrigation and still more developments are desirable.

The system comprises a weir across the Ganges at Narora and the canal takes off on the righthand bank of the river. The weir is a magnificent piece of engineering skill. The river was first divided into five bays and the first on the right has 42 sluice gates which regulate the water supply of the canal. At the time of Mr. Mathur's visit only 37 were working. The four bays are not usually utilised except at times of unusual need of water in years of scarcity when these modern barriers are pulled up and thus the water of the river is stopped and directed into the canal. Formerly the whole river used to be stopped with the result that the rest of the river used to dry up to some extent. The Hindus, some of whom bathe daily in the Ganges, objected to this and consequently in 1929. The Ram Dhera project was financed by the Maharaja of Jodhpur. This is an unobstructed passage for water, with the result that at times when the whole river is barricaded there is enough water for the Hindus to bathe.

The two large branches, the Farrukhabad Branch and the Bewar Branch are taken off at the 26 miles and 40th mile, respectively. The Cawnpore Branch is as a matter of fact, a continuation of the Upper Ganges Canal which falls into the lower Ganges at one point and continues on the other side under the name of Cawnpore Branch. But we call the Cawnpore Branch a branch of the Lower Ganges Canal, as, strictly speaking, the map indicates that the latter takes off from the lower Ganges and not from the Upper Ganges Canal. At this moment we have to forget the history and rely on what the eye sees. But this question is not of any great importance and we need not lengthen our arguments in its favour. It is the utility of the branch that counts and not its name and origin.

The main canal terminates in two great branches, the Ettawa Branch and the Bhognipur Branch, the former being the original Ettawa terminal line of the Upper Ganges Canal and was opened in 1863.

The canal and its tributaries and distributaries irrigate the district of Aligarh, Ettawa, Etah, Mainpuri, Farrukhabad, Cawnpore, Fatehpur and Allahabad, of which the last two districts receive the least benefit, as can be seen from the map.

(3) **The Eastern Jumna Canal.** The Eastern Jumna Canal is one of the few irrigation works that have their origin in a period before the English rule. The canal was constructed by Ali Mardan Khan in the days of Shahjehan in the period between 1718 and 1748 A.D., but it was abandoned later. And it was not till the year 1809 that the British directed their attention towards the reconstruction of the canal. Sir James Ford was deputed to survey the existing canal. A further survey was made in the year 1814 which showed that the channel was obliterated at many places and at many places was covered with forests. A further survey was ordered in the year 1822 and the next year the work of reconstruction commenced. The canal was opened in the month of January 1830. The canal was primarily a single channel without distributaries. The main channel followed the alignment of the old Mohammadan work and then made a turn towards the south *via.*, Muzaffarnagar. The slope was throughout too steep and so falls were introduced.

When first constructed irrigation was effected to the villages by means of openings in the bank, but this process proved wasteful and was not of much profit to a large area. Then as an improvement the natural drainage lines were used but the channels silted up quickly and this led to the construction of regular distributaries. The systems are constantly being extended by the construction of additional branches, but in dry years the canal is unable to cope with the demand. This could be remedied by methods similar to those employed in the case of the Ganges Canal and then the cultivator could enjoy complete immunity from a lack of water in the years of scarcity of rainfall.

The canal system (please see the relevant map) has a length of 129 miles in its main channel and larger branches, 3,344 miles in the distributaries and it irrigates an area of 283,361 acres. It finally falls into the Jumna near Delhi. The districts benefitted by it are Saharanpur, Muzaffarnagar und Meerut.

(4) Agra Canal. This Canal takes off from the Jumna at Okhla, about 11 miles below Delhi (see appended map). It protects that part of the country which suffered considerably in the past from famines due to the lack of rainfall. The canal as it is to-day has 100 miles of length in its main channel, 795 miles in its distributaries, and irrigates an area of 241,578 acres in our region.

The weir across the Jumna is about 800 yards wide. The main channel was completed in the year 1875. The canal falls partly in the Delhi province, and the Gurgaon district of the Punjab, and partly in the Muttra and Agra districts of U. P. Before 1909 navigation was also done in the canal, but it was stopped in that year as it interfered with irrigation.

(5) Sarda Canal. There has probably been no other irrigational scheme in India that has formed the subject of so much discussion as that of the construction of the canal from the Sardar river, the enormous volume of water which used to run waste. The first project for a canal from the Sarda was prepared in 1870. The scheme met the opposition of the landlords on the grounds that it might cause water-logging and prove detrimental to health. Another objection was that the country was during the summer well protected by rains (being in the east) and in winter by the existing methods of well irrigation and that the canal would not be of so much use in the east of the Ganges as the Upper Ganges Canal had been in the west of the same. The Irrigation Committee of 1903, however, after careful examination of all the questions, remarked "We think, however, that the question of constructing a canal for the protection of the western district of Hardoi is deserving of serious consideration."

It was, however, not until the year 1910-11 when an alternative project had been proposed for taking the Sardar river water to the western parts of U. P. and then to the Punjab, that the landlords realised their error, and asked for the revival of the old Sarda Canal project. The work was finally started in the year 1920.

Banbassa was selected for the head works. As it lay in the interior of dense forests, special medical arrangements had to be made for the health of the labour. Again, there was one more difficulty, that part of the land required for head works lay in the State of Nepal and permission had to be sought before any progress could be made. Owing to the heavy rainfall, climatic conditions were very unhealthy and work had to be stopped during the rainy season from July to November.

The entire length of the main canal is about 28 miles, and the first 51 miles of the Kheri branch pass through dense forests which had to be cleared. One more difficulty that was felt during the construction of the canal was that material required for the head works was not available locally and had to be brought from outside.

The main channel of the river frequently changed its course and swung from one bank to the other ; the site of the head works had to be changed to cope with this difficulty, but again when the construction was well advanced an abnormal flood came down the river and showed that on occasions a larger quantity of water might have to be managed. The defect was remedied.

Then again, some of the country traversed contained smaller rivers and streams and the canal and its branches had to be taken over some of them by means of aqueducts and under others by mean of syphons. All these obstructions were gradually overcome and the canal was opened by Sir (now Lord) Malcolm Haily, the then Governor of the United Provinces, on December 11th, 1928.

The main canal is 350 feet wide, cascading over numerous artificial falls. Shortly after its twenty-fifth mile, it is divided into two branches (1) the Kheri Branch, 124 miles long, and (2) the Hardoi Branch, 156 miles long, serving the districts of Piliphit, Shahjehanpur to west of the Ganges and those of Kheri, Sitapur, Hardoi in Oudh. While the Bisalpur branches taking off from the right are 46 and 60 miles long respectively. The total length of the canal is 4,260 miles commanding seven million acres of cultivable area.

In order to cope with the heavy floods and variations in the demand for water in normal years and also to facilitate the emptying of the channels for inspection or repairs 'escape' channels have been provided liberally along the main channel, branches and large distributaries. The annual floods are a source of anxiety, for they carry tons of boulders, shingle and silt and often cause serious damage. Floodlights have, therefore, been installed to deal with debris brought down by the river to the head of the canal at night during the flood season.

The technical details are also not without interest. The barrage at Banbassa (for position of the canal please see the map showing the canal system of the area) has 34 sluices which collectively serve a total waterway of 1,700 linear feet. These sluices were so constructed as to allow big trees that are sometimes carried down by the floods, to pass easily. The canal bay regulator consists of 16 sluice bays each 20 feet wide and is designed to give a maximum discharge of 9,500 cubic feet per second.

Canals of the Bundelkhand. The appended map shows the position of the three more important canals of the Bundelkhand,

viz., the Betwa Canal, the Dhasan Canal and the Ken Canal. The Betwa Canal was opened in 1885. It irrigates small tracts in Jhansi and Hamirpur districts. The canal receives its supplies from the river Betwa.

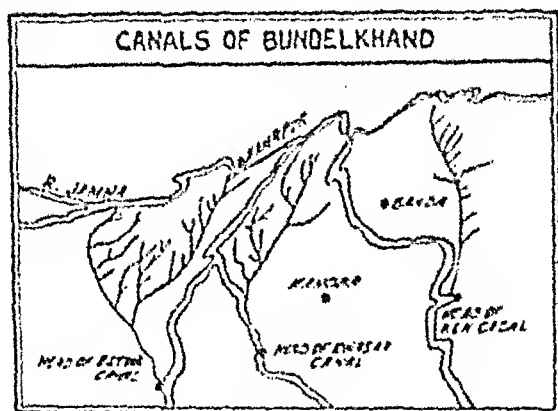


Fig. 45.

The Irrigation Committee of 1903 recommended in strong terms the construction of the Ken and the Dhasan Canals. The latter was opened ultimately in the year 1910 and the former in 1906. The Ken canal irrigates the districts of Banda and the Dhasan canal takes off from the Dhasan weir and irrigates a portion of Hamirpur district. But these canals are of no important use in winter as they take their waters from rain-fed rivers which in winter are transformed into mere streams. The district of Jhansi is the least irrigated by canals and the average irrigated area there is 8,000 acres per year. Then comes the district of Hamirpur with its 9,000 acres of irrigated land. Then there is Banda with its 71,000 acres; but the largest canal irrigated area lies in Jalaun where the irrigated area is about 98,000 acres.

CANALS OF THE PUNJAB

The Punjab presents a magnificent picture of what irrigation can do. The rainfall in the province is nowhere more than 30" and there are places that receive even lower than 10", with the result that a greater area of the province presented a dreary outlook. Today the province is known as the 'grainary of India' and all due to the introduction of the canals. The Punjab today has the largest area irrigated by Government canals—11·4 million acres. The snow-fed five* rivers of the province are mainly responsible for this tremendous increase in canal irrigation. The summer volume of these rivers is about 100 times more than the winter volume and in

*If we add the Jumna and the Indus to the list, and why not, the number comes to seven.

plains they spread for several miles across their width. The land lying between the rivers slopes gently towards Sindh. The soil is soft and fertile*. The conditions are therefore very favourable for canal irrigation. Full advantage has been taken of the facilities available during the last few decades. The province has seen huge extension in the irrigated area. It increased from 2·3 million acres in 1887-88 to about 16·5 million acres in 1938-39. The province has over ten major irrigation works by which the rivers of the province are utilized for irrigation. There are more than 2,810 miles of Government canals and about 15,000 miles of distributaries irrigating a net area of more than 11·8 million acres. The works were constructed at a cost of about 34 crores of rupees and they yield a net revenue of about 14·55 per cent. There are also 979 miles of canals and about over 1,000 miles of distributaries under unproductive works. The largest irrigation projects in the Punjab are (1) The Sutlej Valley Project irrigating about 1·5 million acres; (2) The Lower Chenab Canal irrigating about 2·3 million acres; (3) The Upper Bari Doab Canal irrigating about 1·2 million acres; (4) The Sirhind Canal irrigating about 1·79 million acres and (5) The Western Jumna Canal irrigating about 0·8 million acres. It is interesting to note that "about 40 per cent of the revenue of the province is derived directly from irrigation and a further 45 per cent is obtained indirectly†." It, however, goes without saying that the Punjab has the largest area irrigated by Government works in the country.

Nearly all the present irrigation canals have been constructed during the British reign. The pre-British period saw the inception of only one canal in 1356 built by Feroz Shah Tughlak and another in the times of Shah Jehan. In 1633 a canal was taken out of the Ravi at Madhopur, out of which the Sikhs took out a branch upto Amritsar. There were a few inundation canals in the west of the Province‡ but they were in disrepair and out of use when the annexation took place.

*The water table is deep and the water is brackish, hence no well irrigation on a large scale is possible. Canal irrigation is the only useful alternative.

†The Indian Journal of Agricultural Science—April 1941, p 137.

‡The Khanwa and the Sohag canals were the most important,

The following table gives the details of the various Punjab canals.

Canals	Mileage of channels	Area irrigated (in acres)	Capacity (in cusecs)
1. Western Jumna Canal	1,900	890,054	6,430
2. Sirhind Canal	1,624	1,220,105	9,040
3. Upper Bari Doab Canal	1,504	1,266,671	6,750
4. Lower Chenab Canal	2,437	2,363,112	11,231
5. Lower Jhelum Canal	1,010	865,986	3,970
6. Upper Jhelum Canal	593	287,552	8,783
7. Upper Chenab Canal	1,249	299,312	14,400
8. Lower Bari Doab Canal	1,335	1,235,164	7,200
9. Eastern Canal	312	120,264	S. V. P.* 26,500
10. Depalpur Canal	918	385,476	
11. Pakpattan Canal	1,089	559,743	
12. Mailsi Canal	616	284,150	

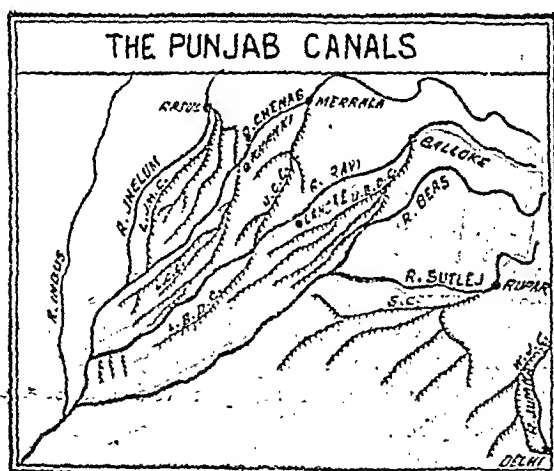


Fig. 46.

(a) The Western Jumna Canal takes off from the west bank of the river Jumna at Tajawala. The canal was originally dug by Feroz Shah Tughlak sometime in the middle of the 14th century but

*40,000 in summer and 18,000 in winter.

no irrigation work of any consequence was intended. It was repaired by the British in the 19th century but soon had to be totally remodelled in the later years of the century—about 1880. Today it supplies irrigation water to the districts of Karnal, Delhi, Rohtak, Hissar and parts of Ambala. The native states of Jind and Patiala also derive some benefit.

(b) The Sirhind Canal takes off from the Sutlej at Rupar. It was dug during 1870-80 and irrigates the districts of Ludhiana, Ferozepur and Hissar. The Indian states of Patiala, Nabha and Jindh not only get water from this canal but they are also shareholders in the river water available for the canal. The smaller states of Kalsia, Faridkot and Malerkotla also derive benefit from the canal.

(c) The Upper Bari Doab Canal has been taken out of the Ravi at Madhopur. It was completed in the year 1860; originally it was the old Hasli Canal dug by Ali Mardan Khan. The British districts of Gurdaspur, Amritsar and Lahore get their irrigation water from this canal*.

(d) The Lower Chenab Canal takes off from the Chenab at a place called Khanki about 8 miles down Wazirabad. The area that is commanded by this canal was formerly a literal waste and the opening of this canal has really been responsible for turning the entire destiny of this land—now it is perhaps the most flourishing canal colony comprising the districts of Gujranwala, Sheikhupura, Lyallpur and Jhang. Originally the canal was opened as an inundation in 1872 but 18 years later it was converted into a perennial canal. The system of water courses for distribution of water to the fields is the best in the world.

(e) The Lower Jhelum Canal is another colony canal, similar to the Lower Chenab Canal in design and outlay, irrigating the districts of Shahpur, Gujrat and Jhang. It has been taken out of the Jhelum at Rasool about 30 miles down the Jhelum. It was opened in the year 1901.

(f) The Triple Canals Project is one of the largest irrigation works in India. The project comprises of (1) The Upper Jhelum Canal; (2) The Upper Chenab Canal and (3) the Lower Bari Doab Canal. The scheme has been designed to irrigate the area lying between the Sutlej and the Ravi and comprising the districts of Multan and Montgomery. This inter-linked canal system is a remarkable feature of engineering skill. The Lower Bari Doab Canal was opened in 1913 and the Upper Chenab Canal was opened in 1915. The Upper Chenab Canal with a tremendous discharge of 14,400 cusecs is about the biggest irrigation work in the world.

No water was left to be spared in the Ravi as the Upper Bari Doab Canal had already used it up; while the water in the Sutlej

*Formerly, it was called the Bari Doab.

was already reserved for use in the Nilibar area. The Upper Jhelum Canal was, therefore, constructed from Mangla to Khanki on the Chenab to carry the surplus water of the Jhelum to the Chenab. An equal quantity of water was taken out at Merala on the Chenab and carried to the Ravi by the Upper Chenab Canal and discharged into it at Balloki. A canal, the Lower Bari Doab Canal, was taken out of the Ravi at this point for the irrigation of the barren area mentioned above.

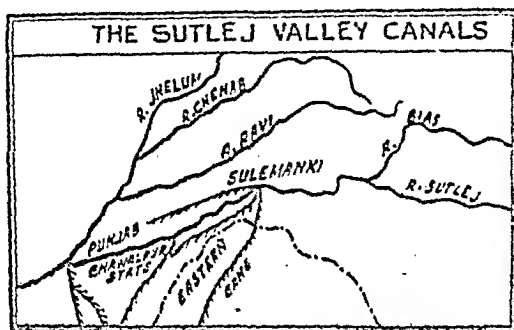


Fig. 47.

(g) The Sutlej-Valley Project, another marvel of engineering skill, was completed in the year 1933 at an enormous cost of Rs. 24 crores. It consists of 3 weirs on the Sutlej at Ferozpur, Islam and Sulemanki and one on the Panjnad from above which eleven canals have been taken out; not less than three million acres of waste land in the Punjab and in the Indian states of Bikaner and Bahawalpur has been made suitable for agriculture and colonization. The Eastern, the Dipalpur, the Pakpattan and the Mailsi canals constitute the British portion of the Sutlej Valley Project.

(h) The completion* of the Haveli Project in 1939 marks the latest development in Punjab irrigation. This replaces the inundation canals in the Multan district. The canal is weir-controlled and takes off from the Chenab below Trimmu just below its junction with the river Jhelum and passing through Jhang district for about 50 miles joins the Ravi at Sidhnai. The idea is to use the water of both these rivers by means of three canals that take off at Sidhnai. The project provides irrigation water to Multan, Jhang and Muzaffargarh districts. Perennial irrigation has been provided to 7,00,000 acres and non-perennial to 8,60,000 acres by this project.

The project is composed of 5 units:—(1) Trimmu Headworks on the Chenab, (2) Abdul Hakim Headworks on the Ravi, (3) Right bank Canals, (4) Left bank canals and (5) the Montgomery-Pakpattan Link.

(i) The construction of the Thal Project was started in 1939 by building a dam across the Indus near Kalabagh but had to be suspended in 1940 owing to the war. If and when completed the pro-

*Completed in April 1939 within less than half the estimated time.

ject would irrigate about 2,700,000 acres in Multan and Mianwali districts, comprising the sandy tract lying between the Indus and the Jhelum. There has been some dispute about the Punjab and Sindh shares of the Indus waters. The findings of the Rau Commission have also not gone to any appreciable length in solving this tangle. The quantity fixed by the Govt. of India as the share of the Punjab is 6,000 cusecs, which will only be able to supply water to about 1,200,000 acres.

(j) **The Bhakra Dam** is contemplated to irrigate a piece of land lying between the Jumna and the Sutlej. It is proposed to build a dam across the Sutlej at Bhakra about 40 miles from Rupar—a point where the Sutlej enters the plains. A scheme of digging a number of tube-wells to irrigate the area is also under consideration.*

SINDH.

Formerly, nearly all the canals in Sindh were of the 'inundation type' being able to supply water only between May and September, during Indus floods. The *Lloyd or the Sukkur Barrage* has now changed the entire shape of things in the province. The barrage now supplies perennial irrigation to about 2 million acres and has also brought an additional three million acres under cultivation.

This is the largest single irrigation work in the whole world and is made up of a barrage about a mile in length across the river Indus at a place called Sukkur where the river is narrowest. Seven canals, 3 on the right and 4 on the left side, have been dug. Their total mileage is about 7,000 miles. Only the Rohri canal (one of the seven) carries as much water as the river Thames in England. The project was completed in January 1932 at a cost of twenty crores of rupees.

MADRAS.

Canal irrigation is very important in Madras. The province claims about 3,937 miles of canals and about 10,129 miles of distributaries extending over twenty-six systems of the productive type.† The area irrigated by canals is about 4 million acres. Amongst the more important schemes are :—

- (1) Cauvery—Mettur Project.
- (2) Godavery Delta system.
- (3) Krishna Delta system.
- (4) Cauvery Delta system.
- (5) Penner River Canals system.
- (6) Periyar system.
- (7) Chicacole Minor River system.
- (8) Lower Coleroon Ancient system.
- (9) Tungahbadra Project (Proposed).

*Other Projects under consideration in the Punjab are, (1) Rohtang Project (2) Tones Dam, (3) The Larji Dam Project, (4) The Marha Project and (5) a canal from Rupar for the Doaba area. The Punjab Government proposes to spend several crores on new works.

†In addition there are 675 miles of distributaries and 831 miles of canals in the province.

The largest schemes, however, are the deltaic systems of Krishna, Godavery and the Cauvery which collectively supply irrigation water to about 2.6 million acres. The main problem in these regions is that of regulation of water supply rather than of extension to new lands. To have a sufficient head of water, weirs have been built and by means of sluices and regulators, the water is conducted over the lands. Vast areas in the deltas have now become suitable for cultivation.

The construction of reservoirs has also been resorted to for an expansion of irrigation. The Periyar Project, for example, uses the waters of the river Periyar by means of a dam built at an altitude of about 3,000 feet and thus turning the river to the eastern side of the peninsula, *via* a 5,700 feet long tunnel. The Mettur Dam is the biggest reservoir of its kind in the world. This project was brought into existence by erecting a big dam across the river Cauvery at a place called Mettur in August, 1940. It irrigates about one million acres of land. It mainly supplements the old supplies and makes second crops possible. In addition about 3 lakh acres in Tanjore have been brought under cultivation.

The Tungabhadra project is another storage scheme awaiting construction.

BOMBAY.

Irrigation in Bombay is mostly carried on in the Deccan. Most of the works are of the reservoir type. The Khadak Walsa Dam built in 1879 was the first of its kind in India. The Wilson Dam at Bhandarera is reported to be the highest dam in India. It has been constructed in the Ghats on the river Pranera and supplies irrigation water to about 57,000 acres in Ahmadnagar. The Lloyd Dam at Bhatgar is "the largest mass of masonry in the world". It has been built on the river Nira and irrigates vast areas in Poona and Sholapur. Together with the Wilson Dam, it irrigates about 450,000 acres.

There are about 5,219 miles of distributaries and 4,031 miles of canals under productive works in Bombay. Of unproductive works, the province has about 1,516 miles of canals and 1,249 miles of distributaries. Amongst the canals, the Desert Canal, the Fuleli Canal and the Pinyari Canal are the most important and collectively they measure about a thousand miles.

TANK IRRIGATION

Tanks form instrument form of indigenous irrigation. The Indian tank may have great variations in size. It may be anything from a magnificent work like lakes Fife and Whiting in Bombay or the Periyar lake in Travancore state, to the very small village tank capable of irrigating about five acres or even less. Tank irrigation is almost absent in the northern plains and is most

pronounced in the Madras Presidency where tanks as old as 1,100 years are to be seen. There are only about 40,000 tanks in the country and they irrigate a total area of about 6 million acres. The tanks in the Madras Presidency irrigate about 3 to 3.5 million acres of land. More tanks are to be seen in Chittoor, North Arcot and in certain coastal areas where canal irrigation has not yet reached. In Chingleput about 85 per cent of the total area irrigated under tanks*. In Mysore and Hyderabad tank irrigation is also important. The Osman Sagar in Hyderabad is the biggest tank in India.

KAREZ SYSTEM

A *Karez* is like a tunnel that taps the underground springs. This system is more prevalent around Quetta in Baluchistan.

About 10 per cent or even less of the total irrigated area is irrigated from "other sources". These have never been clearly defined and consist of local methods of 'damming, bunding and lifting', etc. Kurumbus and Spring channels are found in the Madras Presidency.

Advantages and Disadvantages of Irrigation

1. **Advantages** :—Irrigation has certainly conferred a number of benefits upon the people of the country. The direct benefits are too obvious to be enumerated in detail. They have, however, been briefly discussed below :—

(a) The productivity of the land increases and improved varieties of crops can be introduced.

(b) Due to an increase in production, there is an according increase in the trade of the area more specially in the matter of exports.

(c) A better distribution of population can be brought about, by withdrawing population from congested areas and moving it to the hitherto barren and sparsely populated areas. The Punjab colonies are a shining example of this. The Lower Chenab Canal Colony now has a very thick population while in 1891 the area had only 7 inhabitants to the square mile. In 1931 the density rose to 358. Many prosperous and commercial towns like Lyallpur have sprung up.

(d) As dangers of famine have been altogether mitigated, the cost of famine relief has also been greatly reduced.

(e) Forest plantations, like the Changa Manga in the Punjab, can be established.

(f) The state gains both in revenue and by the sale of the crown (now irrigated) lands. The taxable capacity of the people increases.

*R. C. Wood, *Irrigation-Bulletion* No. 71 of the Deptt. of Agriculture, Madras.

The indirect uses are* :—(a) the increase in the general wealth and prosperity of the community resulting from the increase in the produce of cultivation, due to irrigation even in years of normal or more than normal rainfall ; (b) the effect of irrigation and of large storage works in increasing the humidity of the air and in raising the level of the underground water supply ; (c) the prevention and mitigation of the horrors and the cost of famine ; (d) and the production of hydro-electric power.

2. Disadvantages :—It may be somewhat wrong to think that irrigation has been an *unmixed blessing*. No doubt, the disadvantages are quite insignificant when compared to the advantages conferred upon the people and it is not implied that irrigation should be given up because of the same. Some mention, however, seems quite necessary about the "dangers associated with irrigation."

(a) *Water-logging* signifies a rise in the sub-soil water-level thus rendering the land unfit for cultivation. As water-logging proceeds, yields begin to diminish and patches of *kallor* (salts) appear on the affected ground. The soils, specially in the depressions remain damp. Houses in the locality begin to crumble and may finally collapse. Drinking water begins to taste raw. Finally the affected land may turn into a swamp, if not treated in time. Canals also affect the water-table indirectly. If a canal is so constructed that it intersects all the drainage lines, as is the case with the old Western Jumna Canal, the rain and flood water may be held up and part of it may be added to the water-table after passing through the sub-soil. Severe epidemics like malaria may rapidly spread and mortality may reach an appalling figure as in 1908. Prof Brij Narain nicely sums up the remedies against water-logging† in his "Indian Economic Problems" Part I, page 79. They are :—

1. The natural drainage of the country must be improved. Canals must be so constructed as not to obstruct the drainage of the area.

2. Water proofing of the bed and sides of a canal as has been done with the Gang Canal. The remedy is, however, very expensive and cannot ordinarily be followed.

3 Replacing canal irrigation by well irrigation. It must, however, not be forgotten that well irrigation is far more expensive.

4. Pumping from sub-soil.

5. Construction of seepage canals along side the canals. Into these canals the water percolating from the canals is drawn.

*As given by Prof. George Kuriyan in his essay on "Irrigation in India."

†A small rise in the water table is quite advantageous to the crops. It gets injurious when it comes within five feet of the surface.

‡About 0.25 p.c. of the total irrigated area in the Punjab is water-logged.

(b) *Alkalinity* :—The term means that a number of salts, some of whom may be harmful, are added to the soil. The degree of alkalinity is greater in tropical lands where evaporation is marked. Any concentration of salts “upsets the normal life process of the plant” and “causes the plant to wilt.” The soil may be rendered impervious to the passage of water. Well water is invariably saline and well-irrigated areas are more liable to be affected by alkalinity. The following remedies are suggested :—

- (1) Frequent dressings of silt.
- (2) Improving the texture and perviousness of the soil.
- (3) Use of bulky organic manures like farmyard manures or town rubbish.
- (4) Addition of gypsum (calcium sulphate).
- (5) Digging up the whole top salt-impregnated soil to a depth of about five feet.
- (6) Adequate drainage and flooding.

Alkalinity in the country varies from province to province. There are extensive alkaline tracts in U. P. in the vicinity of the older Ganges-Jumna canals covering an area of about 3 million acres. The Khairpur tract in the Sukkur Barrage area is also under its influence. There is an increasing alkaline area in Madura which is irrigated by the Periyar project.

It may be added while speaking of irrigation, that the excess of water suffocates the plant and prevents it from taking the required supply of oxygen. Arrangements must exist to take away the excess of water from the fields rapidly. Surface drainage or even underground drainage may be used.

CHAPTER VIII

POWER RESOURCES

Supply of cheap and abundant motive power is one of the main problems of countries with industrial ambitions amongst which we must include India. The industrial progress of a country depends to a large extent on the sane development of those sources of power which can be cheaply and economically used. At present the most important fuels are coal and petroleum.* Electric energy is generated either by coal, or petroleum or by falling water. Coal, the main source of power in India is available only at a high cost and in small quantities in areas away from the coal-fields of Bihar and Bengal. Since the separation of Burma, India has been poorly

*Wood and charcoal are also used but to a small extent.

equipped with petroleum—her total* output being only about $\frac{1}{10}$ p. c. of the world total. Water power, therefore, remains the only suitable alternative but even this has yet been only little developed.

1. Coal. India produces about $2\frac{1}{2}$ crore tons of coal of which 82 per cent is had from the coal-fields of Bengal and Bihar. The important coal-fields with their average output have been tabulated below :—

Jharia	...	80 lakh tons
Ranigunj	...	2 " "
Girdh and Daltongunj	...	20 " "
Hyderabad	...	5 " "

The Punjab and Baluchistan coal-fields are very small and produce inferior coal in small quantities. The Jharia coal-fields supply the best quality of coal in India. Most of the Indian coal, however, is of a low quality. The Indian coals belong either to the Gondwana age or to the Tertiary age. The former age located along three various zones : (1) along the Damodar-Son valleys ; (2) along the Mahanadi, and (3) along the Wardha—Godavri valleys in Bengal, Bihar, Orissa and C. P., North-Western India and Upper Assam, contain tertiary coals. According to C. S. Fox† the Gondwana coal-fields have a reserve of 60,000 million tons. Four-fifths of these reserves are in the Jharia and in the Bokaro fields. Tertiary coal reserves are estimated to be about 3,000 million tons and are situated more specially in Assam.

The industry (coal-mining) has rapidly gone up since 1897 when the annual coal output of the country was about four million tons. The peak production of coal was 25 million tons in 1937.‡ In 1941 there were 55 companies working, but the highest number was reached in 1933-34 when the number of working companies rose to 64. The industry employs about 200,000 persons.

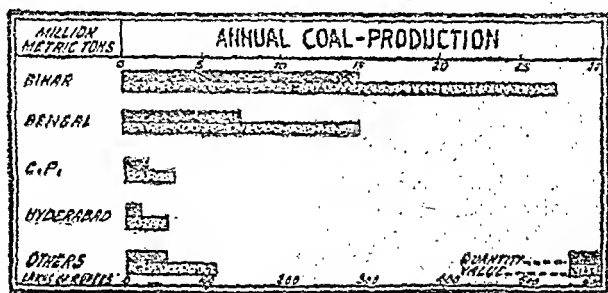


Fig. 47.

*There is vast scope for the production of power alcohol from molasses and of producer gas from charcoal.

†The Lower Gondwana coal-fields of India—1934, Vol. 59 of *Memoris, Geological Survey of India*.

‡1940 saw the 29 million tons limit, which is a record (war).

Over 90% of the coal mined in India is used directly as fuel for various industries ; over two million tons are used for hard coke manufacture used mostly in the iron and steel industry. About one million tons of soft coke is manufactured in India from coal of an inferior order. Dr. M. S. Krishnan gives the following table showing the approximate consumption of coal by the various industrial groups.*

<i>Group</i>	<i>Per cent</i>
Railways	32
Iron and steel and engineering, etc.	22
Cotton and jute mills	10
Bunkering	5
Inland steamers	3
Cement, bricks, etc.	4
Collieries and wastage	10
Others	14

Comparative figures for U. S. A. and United Kingdom are :—

U. S. A.	...	U. K.
Manufacturing industries—57 p. c	..	45 p c.
Domestic	2½ „	19 „
Transport	22 „	6 „

The export trade of coal in India is very insignificant. In 1935-36 about 198,045 tons of coal were exported chiefly to Ceylon (132, 618 tons),† Straits Settlements (16,589 tons) and Hong Kong (41,270 tons). In 1939-40, our exports went up to about 1,990,000 tons (the demand has further increased during the war).

In 1935-36 about 59,437 tons of coal were imported into India specially from the United Kingdom and also from Natal, Japan, Holland, Australia and Portuguese East Africa. This shows a great decrease from the figures for 1913-14 when 531, 814 tons were imported.

The coal industry is now passing through rather hard times due more to under-use, certainly not so to over-production. The future, however, holds bright prospects. The greatest need is cheaper and quicker transport and greater possibility of consumption. The wasteful methods of coal-mining also need looking into. Measures have recently been taken by the Government in this direction.

2. **Petroleum.** Of petroleum India has little. Before 1937 when Burma was a part of India, the total production amounted to more than 311 million gallons. The present Indian production never exceeds 80 million gallon limit, a figure that represents only about 0.1 per cent of the annual production of the world. This quantity is quite inadequate for our local needs, so much so that in 1938 India imported :—

*Industrial Problems of India (1944 Edition) p. 71.

†Dunn Indian Mining, p. 123.

188 million gallons of kerosene.
 135 million tons of fuel oil.
 36 million tons of lubricating oils.
 and 4.53 million tons of motor petrol.*

The occurrence of petroleum in our country is limited to the northern areas specially to the tertiary rock belt extending from Upper Assam to the Arakan coast through the Surma valley and in a similar zone in N.-W. F. Province, the Punjab and Baluchistan. Actual production, however, is limited to the Khaur (6 million gallons) field in Attack (Punjab) and the Digboi field in Lakhimpur (Assam). It is not accurately known what reserves exist in the producing oil fields, but it may be assumed that they may continue production for about 20 to 25 years.†

The demand for petrol is bound to increase during the future. Our local supplies are miserably inadequate. Large imports are, therefore, only natural. Every effort should, however, be made to be economical in this matter. Many ways and means are suggested to bring about the desired economy:—

- (a) Mixing up of petrol‡ and industrial alcohol for use in automobiles. Molasses can yield good alcohol for this purpose. Some power alcohol is being prepared in U. P. and Mysore.
- (b) Production of synthetic petrol out of coal.§
- (c) Utilizing vegetable oil for the production of power.
- (d) Producer gas from charcoal can to some extent replace petrol for running automobile engines.

3. Hydro-electric Power. Coal and petroleum being quite inadequate for the increasing industries of India, hydro-electric power offers the best alternative and holds great promise. What is more remarkable, is that vast water-power possibilities exist in areas with little or no coal and which lie far away from the coal mines. Nature thus seems to have marked out distinctly a 'water zone' and a 'coal zone' so that no part of our country is handicapped in its race of industrialization.§ According to the Hydro-electric Survey of India (1922), the hydro-electric resources of India are about 5,582,000 K. W. or 7,400,000 H. P. It is, however, believed in certain quarters that it is a serious under-estimate and that the actual figure should be near about 27 million kilowatts. India has

*It may be possible to have synthetic motor oil from coal and thus reduce the imports.

†Jain, *Industrial Problems of India*, p. 73.

‡Only 20 per cent alcohol can be usefully mixed.

§One ton of coal can produce 50 gallons of petrol.

Note. India is very poor in gaseous fuels. Natural gas occurs usually in and near the oil-fields. Not much of it is found in India; whatever has been found is little used for industrial purposes. Large amounts of it are wasted in making soft coke.

§Akhtar and others, *Indian Economics*, p. 23

made great progress in the development of her water-power during the last 20 years or so and to-day more than 5,00,000 H. P. is actually used.

Generally speaking conditions are difficult in India, as the rainfall is seasonal and only few rivers have perennial supplies of water. 'Monsoon storage' is the usual device used. The term simply means storing of monsoon rainfall water and thus have a regulated and continuous discharge of water. On an all-India basis Bombay, Punjab, U. P., Bengal, Bihar and Assam are rich in water-power resources (a number of probable sites in all the provinces have been given in the Preliminary Report on the Water-Power Resources of India (1919) pages 40—47 and Appendix).* The Himalayas have a tremendous amount of electric energy available, but as yet very little has been developed.†

The hydro-electric projects at present working in India are either state projects like the Ganges Grid in U. P. or those owned by private concerns like the famous Tata Hydro-electric Scheme in Bombay. The first plant was opened in 1902—the Sivasamudram scheme of Madras. The latest is the Papanasam completed in 1944. The following table‡ gives a gist of the whole Hydro-Electric development in the country.

PRINCIPAL HYDRO-ELECTRIC STATIONS IN OPERATION IN INDIA

Province or State	Project	Location of Power Station	Installed capacity including sets ordered or being installed	Ultimate capacity
Bombay	Tata Power Co.	Bhira	87,500 K. W.	105,000 K. W.
	Andhra Valley Power Supply Co.	Bhivpuri	48,000 "	64,000 "
	Tata Hydro-Electric Power Supply Co.	Khopoli	48,000 "	48,000 "
	Pykara Scheme Madras Govt.	Pykara	44,000 "	69,000 "
Madras	Mettur	Mettur	37,600 "	50,000 "
	Papanasam	Papanasam	21,000 "	28,000 "
	Moyyar			
Mysore	Sivasamudram Mysore Govt.	Sivasamudram	42,000 "	45,000 "
	Shimsha Mysore Govt.	Jog Falls	12,000 "	12,000 "
	Jog Project	Jog Falls	18,000 "	72,000 "
	Pallivasal, Travancore Govt.	Pallivasal	21,000 "	36,000 "
Travancore			18,000 "	24,000 "
Punjab	Ganges Canal, U.P. Govt.	Ganges Canal	8	
	Punjab Govt. Mandi Scheme.	Joginder-nagar	5,000 "	15,000 "
	Jhelum Installation	Buniyar		
Kashmir	Jammu Installation	Jammu	1,226 "	1,500 "
N.-W. F. P.	Govt. Malakand	Malakand	9,600 "	20,000 "

*A Hydro-Electric Survey was created in 1919 but with the coming of Provincial autonomy, it was soon dissolved.

†Only about 6 to 7 per cent of the potential.

‡Adopted from the table given by Prof. George Kuriyan in his Hydro-electric Power in India—p. 74.

At present hydro-electric power has been largely developed in Bombay, Mysore, Madras, Kashmir, U. P. and the Punjab. The more important schemes are fully discussed below ;—

Group A—(South of the Vindhyas)

1. The *Tata's* three undertakings, *viz.*, Lonavala, Andhra Valley and Nila Mula have a combined capacity of 246,000 H. P. The cotton mills and other factories of Bombay consume a major portion of this output—about 150,000 H. P. Advantage has been taken of the heavy rainfall on the Western Ghats. There are three reservoirs or lakes at the top of Bhore Ghat in which rain-water is stored for being used in the Lonavala Works. The Lonavala lake has a capacity of 360 million cubic feet, while the Valuhan and Shiravta lakes together have a capacity of 10,000 million cubic feet. The water from these lakes is conveyed in open masonry canals to the forebay at Khandala and thence by means of steel pipes to the power house at Khopoli at the foot of the Ghats. The normal capacity of this station is 48,000 k. w.

The Andhra Valley Power Supply Company is situated at Bhivpuri on the Andhra river. The river has been dammed and the water thus had, is collected in a very big reservoir and carried by means of a tunnel and pipe lines to the Bhivpuri power station. The scheme is intended to yield about 48,000 kilowatts.

The Nila Mula Works are situated to the south-east of Bombay. They are similar to the Andhra Valley Scheme. The waters of the river have been stored in a big lake and carried to the power station at Bhira which has a capacity of 87,500 kilowatts.

The three projects besides supplying energy to Bombay are also used by (1) the B. B. and C. I. Railway for its suburban train service, and by (2) the G.I.P. Railway up to Poona and Igatpuri.

It is intended to have 48,000 k. w. hydro-electric installation at Radhanagiri in Kohlapur State. Use is to be made of the Bhagvati river.

2. The Mysore Hydro-electric Works have a total capacity of 46,000 H. P. It is also intended to have power stations at Shamsa falls (23,000 H.P.) and at Jog falls (20,000 H.P.), thus having a total capacity of 89,000 H. P. Mysore was the first to develop a hydro-electric scheme in 1902 on the Cauvery river for supplying energy to the gold mines at Kolar. The generating station is situated at Sivamudram. Now the project supplies power to Bangalore, Mysore and to about 200 other towns and villages in the state. It has since been linked with the Krishnaraja Sagar which combines irrigation with power.

3. Madras has four projects in operation, *viz.*, (1) The Pykara Scheme (1932), (2) Annalley (Anglo-American Tea Co.), (1915), (3) Karteri (Aravakand Cordite Factory (1902) and (4) Munnar (Kannan Devan Hills Produce Co.) (1900).

The Pykara scheme is the most important and actually it was only after the completion of this project that the province was really electrified. The waters of the Pykara river have been used by means of storage systems. At full storage the scheme can generate 90,000 H. P., 56 per cent of which is consumed by the textile mills alone and a further 15 per cent is taken up by other industrial establishments.

The Mettur Hydro-electric Scheme is located just below the Mettur Dam on the Canvery. Part of the water stored is used for generating hydro-electric power. The estimated capacity is 50,000 kilowatts, but at present there are only three units of 10,000 kilowatts each. The operation commenced in 1937. The scheme has been linked with the Pykara Works at a place called Erode. Greater extensions are still under construction.

The province has developed another scheme above Papanasam in the foothills of the Western Ghats. The project commenced operation in 1944. The combined waters of the rivers Tambraparni and Kariar have been used by damming the Tambraparni just down its confluence with the Kariar. The total capacity is 21,000 kilowatts.

4. The first stage of the Pallivasal Hydro-electric project was completed in 1940. This is the only scheme worth the name in Travancore State. The falls of the Mudrapuzha river have been utilized in this connection. The scheme consists of a temporary diversion dam and a pressure tunnel. The total effective capacity of the scheme is 21,000 k. w.

Besides the above mentioned schemes which have been developed in South India, the following projects have been partially surveyed. (1) Periyar (40,000 k. w.), (2) Cholatipuzha (30,000 k. w.), (3) Silent Valley (22,000 k. w.), (4) Kumbam (22,000 k. w.) and (5) Punjakare (15,000 k. w.). They await development.

GROUP B.—(North of the Vindhya)

1. The Ganges Valley Grid Scheme has used the falls on the Upper Ganges Canal in U. P. and generates about 15,000 k. w. The scheme supplies energy to about 100 towns and villages in the Ganges Valley and about 2,000 village sub-stations are now connected to the system. For details of the scheme please see the section on Tube-Wells in the chapter on "Irrigation."

2. The Mandi Hydro-electric Scheme in the Punjab has a total output of 150,000 k. w. It utilizes the difference in level of the river Uhl and Rana. The tunnel that carries water from the Uhl to the Rana is without parallel in Asia. The power house is at Jogindranagar in Mandi State. The scheme at present gives 36,000 k. w., which means only a fraction of the ultimate capacity. The scheme when fully completed will serve 14 towns and an area of 46,000 sq. miles.

Amongst the smaller schemes in the Punjab are :—

(a) The Amritsar Hydro-electric installation has a generating capacity of 525 k. w. It utilizes the falls of the Bari Doab Canal.

(b) The Renala station has a capacity of 1100 k. w. The Renala falls on the Lower Bari Doab Canal have been utilized.

(c) The Patiala Hydro-electric plant is located in Nidampur. The plant uses the water of the Ghagar Branch of the Sirhind Canal and has a capacity of 213 k. w. (with a steam reserve of 600 k. w.).

(d) The Egerton Woollen Mills plant at Dhariwal utilizes a fall on the Upper Bari Doab Canal. It has a capacity of 900 H. P.

(e) The Simla Water Power Plant is located at Basantpur on the Sutlej. Its total capacity is 1750 k. w.

The following schemes are under consideration in the Punjab :—

(1) The Kishan Dam (125,000 k. w.).

(2) The Kalsi Dam (30,000 k. w.).

(3) The Bhakra Dam (200,000 k. w.).

(4) The Marhu Tunnel Scheme.

(5) The Larji Dam (125,000 k. w.).

(6) The Rohtang Tunnel.

(7) The Rasul Scheme (also Tube-well).

3. In Jammu and Kashmir, the Jammu Hydro-electric Installation is on the Ranbir Canal of the Chenab river. Its total capacity is 1070 k. w. a bigger plant is possible at Riasi on the Chenab.

The Jhelum Power Installation is located at Mohara. It is capable of generating 20,000 H. P.

The Muzaffarabad Hydel station is situated on the Jhelum and generates 150,000 k. w.

4. The N. W. F. Provinces is a dry area and has no important schemes. The Malakand Water Power Plant on the Swat river, generating about 330 H. P., is the only scheme worth the name.

5. In the eastern regions the following schemes are in operation :—

(a) The Darjeeling Hydro-electric Installation (1000 k. w.).

(b) The Shillong Hydro-electric Installation (200 H. P.).

(c) The Kuesrong Hydro-electric Plant (200 k. w.).

The following schemes are possible in this region :—

(a) The Jatinga River Site (7,000 H. P.).

(b) Maihang.

(c) Someshwari River Site.

(d) Damuda River.

(e) Jaldaka River (12,000 H. P.).

(f) Sikkim (6,500 H. P.).

(g) Tista River (45,000 H. P.).

THERMAL POWER

About 788,200 k. w. of thermal power is generated in India, while its ultimate capacity is 1,036,500 k. w. The following table adopted from George Kuriyan's "Hydro-electric Power" (p. 59) shows the provincial figures :—

<i>Provinces</i>	<i>Installed capacity</i>	<i>Ultimate capacity</i>
Baroda	98,800 k. w.	160,000 k. w.
Bombay		
Sindh		
Madras		
Mysore	49,000 "	49,000 "
Travancore		
U. Provinces		
Delhi		
Punjab	17,500 "	44,000 "
Kashmir		
N. W. F. P.		
Assam		
Bengal	485,700 "	644,500 "
Bihar		
Orissa		
C. P.		
Hyderabad	24,700 "	35,000 "

CHAPTER IX

MINERAL WEALTH

The mineral resources of India, though fairly varied, are not really very great in relation to the vast size of the country—more particularly in comparison, for example to those of Europe (minus Russia) whose area is equal to that of India. Less than 2 per cent of the workers are engaged in mining—most of them in coal-mining. Of petroleum we have little. The total value of the minerals produced in 1938-39 was about Rs. 34,13,93,365 (£25,447,116). The chief mineral products besides coal, are iron, gold, manganese, mica, tin and lime. The table given below shows the annual output of the various minerals :

Chromite	... 44,149 tons
Copper	... 285,076 tons
Diamonds	... 1,729 carats
Gold	... 321,137.8 oz.
Iron ore	... 2,743,675 tons
Lead	... 80,100 tons
Manganese	... 967,929 tons
Mica	... 123,169 tons
Nickle	... 3,015 tons
Silver	... 6,181,000 oz.
Tungsten	... 4,997 7 tons,

India possesses the world's chief supply of mica, chiefly found in Bihar though deposits occur everywhere. Women are specially well-suited for splitting the mica blocks. India also claims about a third of the total manganese production of the world. There are excellent deposits of iron ore—more than two million pounds are being mined. India is reputed to possess the world's highest resources of good iron ore (3,600 million tons).

In 1938 we had a total of 1,953 mines, employing about 306,360 workers. About 43 different kinds of minerals are mined in the country but most of them are found in very small quantities, and India does not enjoy a position of self-sufficiency in respect of most of them. The following table summarizes India's position in respect of the most important minerals :—

Iron ore	...	1·8 p. c. of the world total.
Manganese	...	15·3 "
Copper	...	0·4 "
Gold	...	0·9 "
Mica	...	48·00 "
Rock Salt	...	0·06 "
Gypsum	...	0·31 p.c.

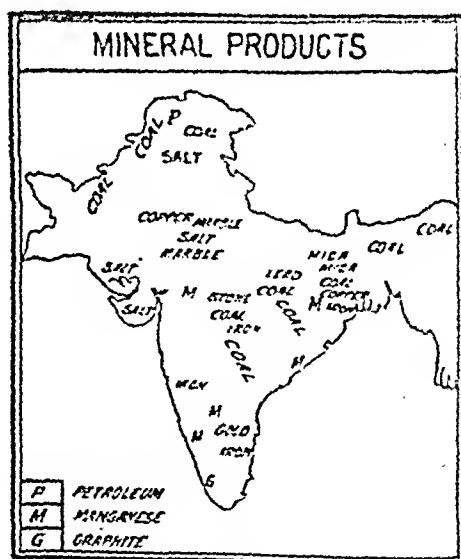


Fig. 49.

We import quite huge quantities of some metals, minerals and precious stones—about Rs. 10 crores worth*.

A brief survey of the more important minerals mined in India may be useful :

*or about 8 p.c. of the Indian imports

1. **Iron ore** of good quality exists in various parts of the country and the quantity mined has been ever since 1929 on the increase. India is now second in the British Empire in the production of iron ore. The annual production of iron ore is about 2,743,675 tons. This shows a good increase from 1914 when the production was about 500,000 tons. Nearly 88 per cent is produced in Bihar and Orissa. Important deposits exist in Singhbhum Keonjhar, Bonai, Mayurbhunj, Central Provinces and Mysore. The following table shows the quantity of iron ore produced in India :—

Keonjhar	...	...	283,489 tons.
Mayurbhunj	...	...	876,939 „
Sambalpur } Singhbum }	...	...	1,155,965 „
C.P.	...	...	800 tons.
East Godavary	...	...	2,1118 „
Mysore State	...	...	24,019 „

A fortunate point in the deposits of iron ore is that most of her mines occurs within short distances from coalfields and deposits of limestones and dolomite which are used for melting. Good railway and road connections also exist.

The ore deposits of Mayurbhunj exist mostly in Badampahar, Sulaipat and Gurumabisaini. In Singhbhum large fields are in Pansura Bum, Gua, Buda Bum and Noamandi, Keonjhar deposits exist in two fields—Bagia Bum ridge and on the north-eastern part, a continuation of Noamundi.

In Central Provinces the Dalli and Rajhana hills hold out future promise, while the fields in Lohara and Pipalgaon supply most of the present production. In Mysore state the main deposits exist in Kammangundi. Some Bombay districts and Madras (Rantnagiri and Salem respectively) have good reserves. The scarcity of power resources has been largely responsible for the little or no exploitation of these deposits.

The increasing industrialisation of the country makes it certain that the demand for iron and steel is bound to go up tremendously as the years pass by. And a greater demand shall naturally bring about a greater exploitation of our own deposits.

2. **Manganese.**—India occupies the second position, first being Russia, in the production of manganese. Manganese is mainly used for the manufacture of pig iron and steel, and it is also used as an alloy. Some is also used in the manufacture of chemicals and in dry cell batteries.

The manganese content of our ores is about 50 per cent and above, which is higher than that of Russian ores—about 45 per cent.

The average annual production of manganese is estimated at about 25,000,000 tons of good manganese ore. The chief deposits are in Bombay, Central Provinces, Mysore, Madras and Orissa :—

C.P.....	335,179	tons (1935).
Madras.....	175,571	"
Orissa.....	74,999	"
Bombay.....	4,885	"
Mysore.....	871	"

The chief centres of production are Nagpur, Chhindwara, Bhandra and Balaghat in C.P. ; Singhbhum, Ganpur, Keonjhar, Bonai and Ganjam in Bihar and Orissa ; Vizagapatnam and Sandur in Madras. Though we still retain a very high position in the production of manganese ore but as is clear from the following table, we are gradually coming down mostly due to the increasing output in U.S.S.R.*

1909-13	...	...	41	per cent of the world total
1914-18	...	...	34	" " "
1919-24	...	...	43	" " "
1924-28	...	...	39	" " "
1929-33	...	...	22	" " "
1934-38	...	...	17	" " "

The iron and steel industry control, to a very great extent, the production of manganese, and as we are not very developed in this particular industry, a greater portion of our total production is exported, ranging between 300,000 and one million tons per year. Most of our manganese is sent out in raw form at low prices. No attempt is made to convert it into ferro-manganese. This is a heavy loss to the country. Most of our exports go to the United Kingdom (1,55,000 tons), France (113,000 tons), Japan (99,000 tons), and Belgium (7,000 tons). A larger percentage of our exports pass through Vizagapatnam and Calcutta. Bombay also sends out smaller quantities.

3. Mica—India is exceedingly rich in Mica. It is chiefly used in the electrical industry for insulating purposes. Mica sheets are also used for the fronts of stoves and furnaces and for lamp chimneys. The marked development in the electrical industry in the country is due to the abundant availability of mica. About 1½ lakh persons are employed in its mining†.

Out of a total world production of about 650,000 cwts, India produces about 180,000 cwts. and is, hence, the largest producer of mica in the world, followed by Canada, U.S.A., and Brazil. Bihar, Madras, Travancore and Rajputana are the chief producers. The following table gives individual figures.

*Wadia and Merchant, *Our Economic Problem*, p. 22.

†Dunn, *Bulletin on Mica*—"The Geological survey of India."

‡As given by Das Gupta in his "India" p. 82.

1. Bihar :—

(a) Gaya	... ..	10,524	cwts.
(b) Hazaribag	... ..	37,679	„
(c) Monghyr	... ..	442	„
(d) Manbhum	... ..	29	„

2. Madras :—

(a) Nellore	... ..	9,452	cwts.
(b) Nilgiris	... ..	43	cwts.

3. Travancore 41 cwts.

4. Rajputana :—

(a) Ajmer	... ..	384	cwts.
(b) Jaipur	... ..	160	„

The mica belt of Bihar supplying more than 75 per cent of the Indian production covers a strip about 60×12 miles. The mica mines of Nellore extend to about 60×10 miles.

According to the estimates made by Dr. Dunn,* the working of mica mines costs rupees five to ten per maund of crude mica; costs in Madras being the same. In Rajputana, however, the cost is lower, about Rs. 3-8-0 per maund of crude mica. Dressing of crude stuff in block mica costs about rupees fifty per maund.

A large portion of ore mica is exported. The war has, however, brought about a temporary set-back. The increased production of mica in South Africa has also affected our exports. Large quantities of artificial steel mica also affect the trade.† Formerly Great Britain was our best customer but imports from Canada and Brazil have now adversely affected our exports to Britain. Our pre-war exports amounted to 3,00,000 cwts—the main customers being U.S.A. (45 p.c.), U.K. (30 p.c.), and Germany (10 p.c.). Most of our mica exports pass through Calcutta which handles about 85 per cent of the total. Bombay also handles about 14 per cent.

4. Gold. Out of a world total of about 40,509,000 ounces of gold, India produces only about 2 to 3 per cent *i.e.*, about 300,000 ounces only per year. The state of Mysore accounts for about 95 per cent of the total Indian gold—the Kolar gold fields‡ are the most famous and account for about 98 per cent of the total Mysore gold. Out of the Indian balance of 5 per cent, a greater portion comes from Anantpur fields in the Madras Presidency. Very small quantities also come from washing in the Punjab, C. P. and

*Dunn, Indian Mining, page 118.

†Charles Forrester in "Economic Problems of India", Vol. II p. 81.

‡Native gold here is found scattered in grains in quartz veins traversing the Hornblende schists of Dharwar System.

the United Provinces.* The small Nizam's mine at Hutti was opened in 1903 but has not been worked at all since 1920. Formerly Raichur and Dharwar produced some gold but now they have ceased production.

The Kolar gold-field is situated at a height of about 2,800' about 40 miles away from Bangalore. Four companies work a reef about 5 miles long and 3 feet wide. It is estimated that the average tenor is about 8 to 10 penny weights† of gold per ton of ore. About 24,000 workers are employed in the fields. Electric power is had from (since 1902) Sivasamudram on the Cauvery river about 92 miles away from Kolar. The Kolar mines power station supplements the above and also serves as a stand-by. The production of the field has been showing a decline. It reached its highest in 1905 when 616,758 ounces‡ were won. The depth of the mines is everywhere more than 4,000 feet; at places like Champion Bay and Ooregum mines, it is 7,811 feet and 7,661 feet respectively. The mining area is well-connected by the lines of the Madras and South Marhatta Railway.

The chief importers of the Indian gold are U. K., U.S. A., France and Netherlands; while the chief suppliers of gold to India are U.K., Arabia, Ceylon, and Baherin Islands.

5. Copper India produces only about 7,000 tons of copper valued at about Rs. 45 lakhs. Copper ore deposits occur in Bihar, Madras, Rajputana, Sikkim and a few other places in the Himalayas. In peninsular India copper ores occur both in the older crystalline rocks and also in groups of younger age §. In extra-peninsular India ores occur in highly metamorphosed rocks. § The Bihar deposits are the only ones which have been producing regularly. The Sikkim deposits can be used only if transport difficulties are overcome. The existence of good quantities of copper in Sikkim has been established. In the Singhbhum district of Bihar (continued into Orissa) the copper belt extends from Duarparam to Mayurbhanj about 80 miles in the east. The belt has signs of many ancient workings. The Singhbhum mines are controlled by the Indian Copper Corporation Limited¶ and employ over 800 workers. The chief mines under this concern are (1) the Rakha Hills Mines, (2) Mosabani Mines, (3) Sideshur-Khendadih Mines, and (4) Dhohani Mines.

In Madras the Nellore district produces about 400 tons. Copper also occurs in Hazaribagh (Bihar), Central India and Mysore.

*Alluvial gold is had at Singhbhum (Orissa), Jhelum, Attock and Ambala (Punjab), Bijnor (U. P.), Gilgit (Kashmir) and Assam (Brahmaputra Valleys). The amount produced is small, not more than Rs. 4,000 in value—India by A. Das Gupta—pp. 81-82.

†20 Penny weights (dwt.) = 1 oz.

‡Indian year Book 1944-45—p. 663.

§Those of Cuddapah, Bijawar and Aravalli groups are good examples.

§Brown, India's Mineral Wealth—p. 86.

¶This concern was created in 1924 by the amalgamation of many previous companies employed in copper mining—(1) The Cape Copper Company (1919-23), and two others (1920-24).

In 1935, 934, 589 short tons of ore were treated in the mill and the production of refined copper amounted to about 7,000 long tons. The most important and the best plant for smelting and refining is at Ghatsila.

Most of our copper is used in the manufacture of brass* goods. Our annual consumption of copper far exceeds our production and we have to import copper and copper alloys of the annual value of Rs. 170 to 200 lakhs. This is in addition to the copper imported along with electrical machinery.

(6) Silver. It is another important metal that India requires in large quantities. It is used both for making ornaments and coining rupees and other coins. Hence its demand is greater than that of gold. The world production is about 7,800 metric tons†, out of which India produces only about 25,000 ounces. In 1935, before the separation of Burma, the total production was 5,850,406 ounces.

The Kolar fields of Mysore are a regular source of silver, where it is produced as a by-product of gold. In 1935 they accounted for 24,477 ounces of silver. Other centres are Manbhum, Anantpur and Mewar.

India is the largest consumer of silver and she imports about £10,000,000 worth of silver annually‡ chiefly from Australia, Burma, U.S.A., and Japan.

(7) Salt. The salt industry is India's fourth most important mineral industry. Salt is an article of every-day use in the country and its consumption is very huge§. The Government of India controls the entire supply of salt; it can be produced either under a Government license or by Government agency.

The average annual production of salt in India is about 1,539,663 tons (1938); about two-thirds of this total is obtained from sea-water in Madras and Bombay. The balance is had either from inland drainage areas¶ or quarried chiefly from the Salt Range§. Most of the salt produced in India is 'common salt' and is put to very little industrial use.

*With the increasing use of aluminium goods, the demand for brass is on the decrease.

†World Production of Raw Material—p. 32.

‡Wadia, Geology of India—p. 351

§About 1/3rd of the total amount consumed is imported.

¶For example the Sambhar Lake in Rajputana.

§Mandi in the Punjab and Kohat hills in N. W. F. P. are also quite important.

Note. Dr. R. N. Dubey in his 'India' summarizes the ideal conditions for salt-making thus (p. 147) :—

- (1) Proximity to sea to have easy access to brine.
- (2) Scanty or no rainfall.
- (3) Strong insolation, which in turn depends upon cloudless skies.
- (4) Moderate to strong winds.
- (5) Moderate to high air temperature with large deficiencies of moisture.
- (6) Moderate to high evaporation which depends upon the foregoing factors.

The sea coasts of Bombay and Madras are very important for the salt industry. Dharsana and Chharnad in the Gulf of Cambay and Okha in Kathiawar are very important. The Rann of Cutch and Muyrpur in Sindh also produce some salt. Madras contributes more than $\frac{1}{3}$ rd of the Indian total. The industry is more important in the belt extending from Ganjam to Tuticorin. Udipi in Malabar also produces some.*

The sub-soil and lake brines of Rajputana are other sources of salt. The Sambhar lake† near Ajmer in Rajputana produces about $2\frac{1}{2}$ lakh tons of salt annually.‡

Bengal produces only about 267 tons of salt annually. Her damp climate and fresh water stand in the way of the industry. She largely depends on the supplies of salt imports that come chiefly from U. K., Germany, Aden, Bombay and Madras.

Rock salt is mined principally at Khewra—Nurpur and Warcha have subsidiary mines. Khewra has been important for salt-mining for long, but it is only since 1870 that systematic mining has been introduced there. The rock deposits at Khewra (Mayo Salt Mine Hill) are about 550 feet thick—pure, marketable salt, however, has a thickness of about 275 feet only.§

Our annual consumption is about $13\frac{1}{2}$ pounds per head of population (including salt used in agriculture and industry). The imports represent a little less than $\frac{1}{4}$ th of the total consumption which is about 52,000,000 maunds per year approximately. The imports have been gradually going down. About 35 (or more) per cent of our imports come from Aden which until recently was under the governor of Bombay. The following table shows sources of our salt imports (pre-war).

Aden	...	...	35 per cent.
East Africa	...	...	16 "
Egypt	...	...	13 "
Germany	...	...	13 "
Spain	...	...	12 "
United Kingdom	...	...	8 "

Saltpetre and gypsum are the only industrial salts produced in India. Crude saltpetre has been prepared in India by native methods which consisted mainly of decomposition of cow dung and subsequent treatment of soil with wood ashes. Saltpetre is mainly used in tea-gardens and for the preparation of gun-powder in coal and other mines. The last Great War gave an impetus to a more or less dead industry. India produces about 8,700 tons of refined salt-petre. The principal Indian provinces producing saltpetre are Bihar,

*The manufacturing season is from January to June.

†The lake covers an area of about 90 sq. miles.

‡Didwana and Pachbadra are also important.

§Dubey, India, pp. 149-150.

Punjab and the United Provinces. The main centre of its manufacture is Farrukhabad in U. P. India exports nearly all of her salt-petre. In 1939-40 about Rs. 17 lakh worth of salt-petre was exported chiefly to U S A and the United Kingdom. Our other customers are China, Ceylon, Mauritius and the Straits Settlements.

Gypsum is mainly used for making plaster of Paris. It is also used as a soil-conditioner. Considerable quantities are had in the Punjab and the N. W. F. P. where it occurs in association with rock salt. Deposits of minor importance occur in Bikaner, Jaisalmer and Jodhpur States and in Trichnopoly (Madras). The average Indian production is about 70,000 tons, about 50 per cent of which is had from the Punjab. The Punjab mines are capable of producing much more but owing to their great distance from the chief consuming centres, the production has not developed fully. The Jhelum, Mianwali and Shahpur districts are important for gypsum deposits in the Punjab. Small deposits also occur in Baroda and Kashmir.

Gypsum contains about 20 per cent of sulphur and as such it could prove a good source for the same as we do not possess good sources of sulphur. It can also be used as sulphuric acid—more specially dry gypsum.

We have already given the annual outputs of some of the minerals. We have also described some of the more important minerals in some detail. Below is given a table, that gives the occurrence of some minor minerals (Pithawala, "The Mineral Resources of India") :—

<i>Mineral</i>	<i>Localities</i>
Antimony	Chitral, Lahaul (Spiti)
Asbestos	Madras, Mysore, Seraikela
Bauxite	Khairagarh, Nagdaon, C. P. and C. I.
Chromite	Mysore, Singbhum.
Clays	...Scattered over the Peninsula, Sindh. (Fuller's clay).
Cobalt	... Jaipur, Nepal.
Diamonds	...C. I., Panna State, Golconda, Upper Vindhyan System.
Sandstone	...Naini (U. P.), Bikaner, Baroda, Salt Range, Deccan river beds.
Graphite	...Eastern Ghats, Betul, Travancore, Kolar, Ajmer-Merwara.
Lead—Zinc	...Mewar, Jaipur.
Limestone	...Sindh, U. P., Punjab, Jodhpur, C. P.
Monazite	...Travancore, Tinnevelly and Vizagapatam

Phosphates	...Singhbhum and Trichnopoly.
Potash	...Gangetic Plain, Sindh, Punjab, Salt Range.
Sulphur	...Bihar, Simla Hills, U. P., Sambhar Lake, Salt Range.
Tungsten	...Jodhpur, Nagpur.
Nickel	...Rajputana (specially Khatri), Kolar, South Travancore, Singhbhum.

Very few of our mines and quarries are worked satisfactorily.* There is an intense dearth of skilled labour and qualified official class. Waste is a major problem. Most of the minerals exported, are sent out in a raw and unfinished form. Owing to a lack of inland water-ways, railways are mostly used for the transportation of minerals, a factor that often raises the price of the transported commodity considerably.† Sometimes South African coal is cheaper in the Indian ports specially in the south and the west. Cheaper transport is, therefore, a crying need.

In spite of the useful work done by the Geological Survey of India, we have but scanty information about our 'hidden treasures'. Most of the Indian states have done no work in this direction. "Explore more Minerals" is, therefore, the legitimate cry of the day. Our demand for minerals is low. Greater industrialisation will go a long way in *compelling* us to explore and take account of our resources.

We have never paid any heed to "the conservation of our resources"‡ This is more true of our mineral resources. Dr. S. M. Tahir Rizvi asserts that problems of conservation are vital to each and every citizen of the nation§ It is the only possible solution for ensuring a better life to the future generations both in the economic and political spheres.

*About 600,000 persons are employed in mining in India.

†A ton of coal costs four rupees at the pit mouth in Bengal and Bihar but by the time it reaches Sindh or Bombay, it costs about Rs. 20.

‡The term simply means that the maximum benefit should be derived from the resources.

§Dr. S. M. Tahir Rizvi—Presidential Address before the Geography Section of the Indian Science Congress, 1941.

CHAPTER X.

INDUSTRIES.

The present is an age of science. It is no doubt true that no country can be reasonably self-supporting without agriculture. But "industrialisation/ has come to be regarded as a necessity and more or less as synonymous with civilization".* The average per capita income from industries is many times higher than from agriculture as is evident from the following table† :—

Country	Industries (Rs.)	Agriculture (Rs)
Japan	158	57
Sweden	384	129
Canada	470	213
United Kingdom	412	62
U. S. A.	721	175
India	12	59

India, however, is more agricultural and less industrial and only a very small fraction of her population (about 2,000,000 persons) are engaged in industries. Most of the industrial development has taken place in the present century. The last Great War gave a powerful impetus to the Indian industries so much so that in 1922, India was given a place amongst the first eight industrial countries on the governing body of the International Labour-Office at Geneva. In 1914, we had only 5,373 factories of all kinds employing about 12,80,000 workers. In 1939 at the beginning of the second war, we had about 9,500 factories and about 2,000,000 industrial workers.

Before we actually come down to a detailed study of the Indian industries and their geographical location etc, it seems better if we briefly discuss the geographical requirements of industries.

* Visvesvaraya, Planned Economy for India, p. 37.

†Ibid, p. 37.

‡This is due to the vast population and low industrialisation of the country

¶This point may give a wrong impression about the actual state of affairs. India's claim was based on agricultural plus other workers and not only on manufacturers.

||Lokhnathan, Industrialisation—p. 5.

§Some rough idea of the industrial advance of the country may be had by the amount of income-tax paid by the various provinces to the Central Government (1941-42) :—

Bombay—6·97 crores.
Bengal —6 97 „
Madras —2·17 „
U. P. —1·47 „
Punjab —1·32 „

(Taken from "Heavy Industries in India", published by A. I. M. O., Bombay).

(a) A cheap and regular supply of *power* is the greatest need in a modern manufacturing industry. Coal is the cheapest and the best source of power at present but it tends to attract the industries to the coal-fields. Electricity specially hydro-electricity, tends to decentralise as in this case power can be easily and quickly transported to any region where it is needed. In India coal is still the main source of power and most of the heavier industries are situated near the coal fields.

(b) *Raw material* is another important requisite. It may be locally available or may be carried to the places of need. In the case of perishable raw material, however, it is essential that the factories be situated nearby.

(c) *Transport facilities and markets* are also quite important. An industry has to be adequately connected with raw material and markets. Many industries develop near markets. Lack of good transport facilities very often holds back progress as is the case in China which has raw material and power but no easy communications.

(d) Cheap, abundant and in many cases skilled *labour* is another dominating factor. The cotton industry of Lancashire owes much to its skilled labour found in the area. Japan could rise so high industrially mostly due to the cheapness of her labour.

(e) In many cases *climate* also determines the location of industries. The cotton industry of Bombay is partly due to its damp climate. The invention of artificial humidifiers has, however, mitigated this factor.

(f) Besides the above, there are many other factors like *Rates, Tariffs and Bounties*. Official *encouragement and discouragement* also go a long way.

The phenomenon called "*Geographical Inertia*," should also not be ignored. The term simply means that once an industry is established at a place, it continues to be there in spite of the fact that one or more factors may have ceased to be active. This is greatly due to *human factors*.

As opined by Dr. Lorenzo in his 'Atlas of India', "the proper view of industrial evolution and progress in India is physico-environmental." The principal organised industries occupy well-defined zones. The areas near the coal mines of Bengal and Bihar contain the bulk of iron and steel factories of the country. The cotton industry tends to be centralised near Bombay and Ahmedabad because of the humid climate and the proximity of raw cotton in the black-soil area. Calcutta contains more than 90 per cent of the jute mills of India. The railway track in the cane-producing areas of U. P. and Bihar boasts of nearly all the sugar factories in the country.

Regular statistics of industrial establishments in the country (except for organised industries) are not completely available. There is a large number of minor or cottage industries scattered all over the country, about which we have no information at all. An industrial survey is, therefore, an immediate need. It is only roughly estimated that about 5 per cent of the population are engaged in industries and that the total value of products of Indian industries is about one-sixth of the total value of agricultural and industrial (and other) products.*

The following three tables give a bird's eye-view of our industries and their place in the economy of the country.

Table I;

Large-scale industries in India (1939).

<i>Industry</i>	<i>Number of factories</i>	<i>Persons employed</i>
Cotton	423	569,025
Jute	105	309,000
Silk	69	6,917
Woollen goods	18	8,075
Iron and steel	13	42,158
Engineering, Foundaries and ship-building	1,006	222,070
Sugar Factories	175	79,078
Paper and Printing etc.	489	51,174
Tobacco	30	10,984
Glass	63	7,997
Leather	73	14,067

Table II†

No. of factories in the Provinces.

Bombay	... 2,495
Madras	... 1,818
Bengal	... 1,735
Punjab	... 780
Assam	... 765
C. P. and Berar	... 737
U. P.	... 530
Bihar	... 311
Orissa	... 80
Delhi	... 78
Ajmer-Merwara	... 35
N. W. F. P.	... 30

*Planned Economy for India by Visvesvaraya—p. 40.

†Based on "Atlas of India" by Lorenzo and Large Industrial Establishments in India (1939).

‡Statistics of factories for the year ending December 31, 1938 pp. 1-10.

¶About ½ are seasonal.

Table III

Number per mille of industrial workers.*

Textiles	... 258
Hides, skins, etc.	... 21
Wood	... 113
Metals	... 48
Chemical products	... 42
Food industries	... 95
Others	... 421

Now we are in a position to discuss some of the more important manufacturing industries in some detail. We shall discuss the following industries.

- | | |
|---------------------|--------------|
| (1) Iron and steel. | (6) Rubber. |
| (2) Cotton. | (7) Woollen. |
| (3) Sugar. | (8) Silk. |
| (4) Jute. | (9) Leather. |
| (5) Paper. | (10) Others. |

(1) Iron and steel. Iron is the most important of all industrial metals, although in intrinsic value it ranks lowest amongst all. Copper is twenty times more costly and even zinc and lead are three to four times dearer as by weight. It may not be out of place to quote here a few lines from Rudyard Kipling :—

Gold is for the mistress, silver for the maid,
Copper for craftsman, cunning at his trade,
"Good" I said the Bacon sitting in his hall,
"But Iron—Cold Iron—is master of them all."

The iron and steel industry has a better claim than any other industry to be called a basic, or "key" industry and its national importance cannot be exaggerated. Iron is required by every country for the development of her industries, for transportation, and for proper utilization of her raw materials and for manufacturing efficient machines for offence and defence and above all to maintain "their steel-shod, steel-armed and steel-armoured type of civilization."

The latest data available shows that we have thirteen (13) iron and steel factories and about 80 foundaries, employing approximately about 150,000 workers†. Our annual production of pig iron is about 1,838,000 tons. Corresponding figures for *finished steel* are 804,469 tons and for *steel ingots* 1,070,355 tons. These figures show a tremendous increase from 1914 figures when India

*As quoted by Ishwara Topa in his "Facts about India" p. 368.

† 600,000 including dependents.

produced about 162,282 tons of pig iron, 98,726 tons of finished steel and about 139,433 tons of steel ingots. The last war gave a great push to the industry. Since September 1940, Britain has been getting 50,000 tons of pig iron every month from India.

The knowledge of iron smelting by primitive methods in India possesses a high antiquity. The iron pillar at Delhi, considered to be about 1,500 years old adequately justifies this claim * Steel is reported to have been exported from the shores of the Ganges to the Western countries.† There are some iron tools in the British Museum and it is believed that they are from India‡ But the production of pig iron and steel by new methods is very recent an affair. Kulti has been making pig iron since 1875. Upto about 1914 and after, India had to import large quantities of iron and steel (about

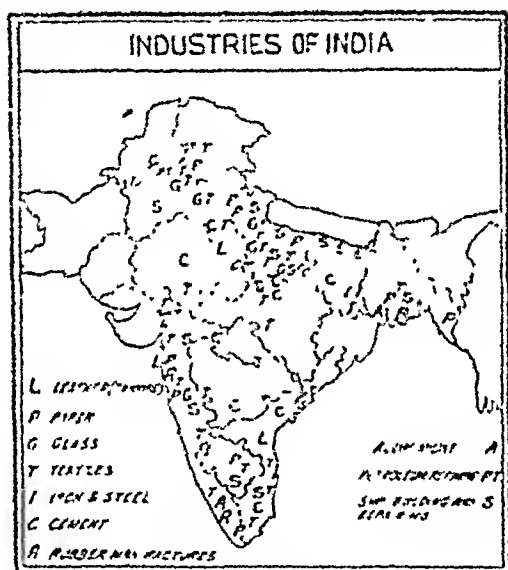


Fig. 50.

1,250,000 tons), besides machinery (about £5,000,000 worth) of all kinds (including electrical and textile). As a result of the reform of 1919, India secured "Fiscal Autonomy."§ The iron and steel industry was the first to gain by this policy. After 1924 the industry was able to increase its production and displace imports to a good extent.

The Tatas founded the Tata Iron and Steel Company near Bihar coal-fields on a site (Sakchi) where pure iron was discovered, in 1907.

* Essays on Indian Economics—Ranade, p. 172.

† Ibid.

‡ Iron Work—Gardener p. 24.

§ The right to protect her industries against foreign competition.

To-day the Tatas are the largest steelworks in the British Empire and in 1939-40 they produced over a million tons of steel ingots, and three-quarters of a million tons of steel, in addition to over a million tons of pig iron. On this site has now grown up a well-planned town of Jamshedpur having about 150,000 inhabitants. During the present war the concern has been making about 50,000 tools for the army every month. Jamshedpur is only about 50 miles from Gurumahisani where the Tata's own valuable concessions. Coal is brought from Jharia about 100 miles away. The concern also enjoys magnesite and chromite concession in Mysore and C. P. respectively. Limestone and dolomite are available in the neighbourhood. (Gangpur). The small river Subarnarekha supplies water to the industry. For the summer months when the Subarnarekha almost dries up, arrangements have been made for hoarding water in the river Kharkai by constructing a dam across it. The centre is served by the main line of B. N. Rly. running from Calcutta to Bombay. The coal and iron-ore supplies for the factories are brought by some branch lines of this railway.

Besides the above, the chief iron and steel centres are (a) Bengal Iron Company at Kulti; (b) Indian Iron and Steel Co., Ltd. at Burnpore; (c) United Steel Corporation of Asia at Manoharpur; and (d) Mysore Iron Works at Bhadravati.

(a) The Bengal Iron Company is situated at Kulti (142 miles from Calcutta) and is capable of producing 250,000 tons of pig iron annually. The works specialise in the manufacture of cast iron products and large foundaries are, therefore, situated near the blast furnace-plants. Coal is had from the Raniganj coalfield and also from Jharia fields. Ore comes from Pansira, Ajita and Maclettan mines situated nearby in and around Singhbhum. Formerly iron-stone shales found near the works were used for taking out iron ore, but the practice has been stopped.* The works normally employ about fifteen thousand workers.

The original works at this side were first started in 1875, but the out put was not very satisfactory. In 1882, the works were taken over by the Government. In 1889 they were resold to the Bengal Iron and Steel Co. Ltd., which in 1919 were succeeded by the Bengal Iron Co. Ltd.

(b) The Indian Iron and Steel Co. Ltd., commenced manufacture of iron in 1922 at Burnpore (near Asansole and about 132 miles from Calcutta) on the Bengal Nagpur Railway. Coal is had from Raniganj, batteries of Simion—carves ovens make coke at the works.† The works get the ore from the mines at Gua in the Singhbhum district. Bhandigudda about 14 miles to the east, supplies limestone, while wood comes from the nearby forests. The works manufacture both steel and pig iron as well as ferro-

*India's Mineral Wealth by Brown. p. 114.

† Ibid. p. 116.

manganese. The production of pig iron is about 300,000 tons per year.

(c) The Limited Steel Corporation of Asia have their factories at Manoharpur, and get their ore from Keonjhar mines.

Another company known as the National Iron and Steel Co., Ltd., was registered in 1934 and has started a factory at Belur in Bengal. The factory is meant for the manufacture of mild iron rounds, bolts and nuts etc. Some steel bars and steel castings as well good quality alloy steel are also manufactured.

(d) The Mysore Iron Works are located at Bhadravati in Mysore. They are owned by the Mysore Government and were started (chartered in 1923) in 1930. The works are capable of producing 60 tons of pig iron per day. They also consist of a wood distillation plant where charcoal is used for fuel; the by-products *i.e.*, wood-tar, wood alcohol and calcium acetate are recovered in sufficient quantities.* The rich forests of Mysore supply the charcoal (as no coal is available anywhere near here). Ore comes chiefly from the Kemmangundi field in the Bahabudan Hills about 28 miles south of here. Limestone is obtained from Bhandigudda near Gangpur, 13 miles east of Bhadravati. Siliceous ores are had from a quarry in Birur. The Birur-Shimoga branch of the Mysore State Railway serves the centre.

The works produce about 15,000 tons of pig iron every year. The works also produce a large quantity of chemical by-products from coke† as already mentioned. Slag and other by-products of the iron works are now utilized from the manufacture of cement.‡

The following table shows clearly the expansion of the industry during the last four decades.

Period	...	Production (tons)	...	...
1900-01	...	35,000	tons of pig iron.	
1913-14	...	162,282	" "	" "
1918-19	...	232,268	" "	" "
1929-30	...	1,376,000	" "	" "
1930-31	...	1,140,000†	" "	" "
1938-39	...	1,576,030	" "	" "
1939-40	...	1,837,000	" "	" "

The figures for manufactured steel for 1939-40 are :—

Finished Steel	...	804,000 tons.	
Iron Castings	...	1,129,000	"
Steel Ingots	...	1,070,000	"
Semis	...	872,000	"

*Brown, Mineral Wealth of India—p. 116.

†R. Dubey, India—p. 157.

‡Hand Book of Commerical Information for India—pp. 294-295.

¶Owing to reduced exports.

The above may be compared with the pig iron and steel production of some other countries.*

	Pig iron	Steel and castings.
U.S.A.	31 million tons	48 mill. tons.
Germany	15 "	19 "
Russia	14 "	16 "
Great Britain	8 "	12 "

In 1936, the Indian Iron and Steel companies were reconstructed and the Steel Corporation began working in November 1939 near Calcutta with a plant capable of producing 260,000 tons per annum. Since the beginning of the present war, an arrangement has been arrived at between the Tatas and the Govt. that war requirements must be served first. The development of the industry on a large scale has led to the rise of a number of subsidiary industries like wagon-building, engineering, tin-plate, wire and wire nails, enamelled ware and the manufacture of agricultural implements. A number of subsidiary industries have developed more particularly around Jamshedpur; so much so that it is remarked that the area is developing into a "regular beehive of modern industries."†

Trade. About 33 per cent or one-third of the total Indian production is exported. In 1938-39 Japan purchased about 200,000 tons of our pig iron and was thus the chief pre-war customer. Our other customers are United Kingdom and U. S. A. (inspite of the fact that they themselves produce huge quantities of pig iron and steel). The following table‡ shows the condition of our export trade during the last ten years§ or so :—

	Pig iron	Iron and Steel
	thousand tons.	thousand tons.§
1934—35	417	57
1935—36	538	57
1936—37	574	105
1937—38	629	87
1938—39	514.5	84.6
1939—40	571.8	106.5
1940—41	599.5	104.0
1941—42	521.5	40.2
1942—43	242.1	6.1
1943—44	186.3	2.1

The imports of pig iron are now quite negligible amounting to about 2,800 tons in 1938-39 and come mostly from the United King-

*As given by Dr. Dubey in his 'India'—p. 158.

†Formerly Sakchi.

‡Indian Economics, Jathar and Beri—p. 50 (Vol. 11).

§As given in the Hindustani Year Book (1944-45)—p. 146, and "Our Economic Problem" by Wadia and Merchant—p. 304.

¶The bulk of our exports pass through Calcutta, as is natural.

§Madras (and Burma) export large quantities of manufactured iron and steel.

dom*. As compared to this the imports in 1914 were about 808,000 tons of iron and steel. During the last *great war*, our imports went down considerably and the Tatas increased their output tremendously. Our imports of iron and steel in 1938-39 were about 272,000 tons†, owing to our increased production. But as is apparent we have still to depend greatly on foreign imports of iron and steel and machinery.

(2) Cotton Industry. India is the accredited birth-place of cotton manufactures. Here it has flourished from pre-historic times.‡ Today it is the most important industry in the country, claiming about 400 mills employing about 500,000 workers daily and producing about 4,269 million yards of cloth yearly. The rapid growth of the industry can be easily seen from the following table§ :—

Year	No. of Factories	No. of Spindles	Daily workers employed	Production of cloth (in million yds.)
1876	47	1,100,112	...	678
1900	193	4,945,783	161,189	1,164
1913	271	6,778,895	253,786	1,970
1925	337	8,510,633	367,877	1,790
1941	390	8,961,178	459,509	4,269
1943	401	8,403,126	...	4,858

India is one of the most important cotton manufacturing countries in the world and ranks third in the number of workers employed by the industry. It consumes more than 50 per cent of the total Indian cotton crop production in a year—in 1943-44 about 4,319,000 bales (of 400 lbs. each) were consumed. Before the last war about sixty per cent of the cotton piece-goods used in the country was imported. Now she can practically supply her entire requirements¶. Imports of Lancashire goods have fallen from 3,000 million yards before 1914 to about one tenth of that quantity and consist mostly of fine cloth. Four regions *i.e.* Bombay, Bengal, Madras and U. P. monopolise the industry at present. In 1939, out of a total of 398 cotton mills, Bombay Presidency claimed 222, 30 were in Bengal, 48 in Madras and 26 in United Provinces. Bombay and Ahmedabad are the most important cotton manufacturing centres in India. These have a number of advantages, most significant of which are (a) Proximity to the raw material—the Black cotton-soil region which is renowned for its cotton production,

*Review of the Trade of India (1938-39) pp. 94 and 136.

†The present war has brought about a further decrease—in 1943-44 only about 47,000 tons were imported

‡J. A. Mann—Journal of Royal Asiatic Society of Great Britain vol. XVII p. 347, and Baine, The History of Indian Manufactures.

§These figures have been taken from (a) "Indian Economics" by Akhtar and others, (b) The Hindustan Year Book 1944-45 and (c) "The Cotton Industry of India" by K. L. Govil

¶About 75 per cent of the demand to be exact.

supplies cotton to the mills of Bombay and Ahmedabad ; (b) the hydro-electric power produced on the Ghats is used in the mills in Bombay. If it had to depend entirely on Bengal coal, perhaps conditions might not have been so bright ; (c) the humid, marine climate is most suitable for cotton manufacturing, a factor that is so nicely met in Bombay ; (d) The natural harbour of Bombay and its nearness to European countries have also contributed appreciably towards the concentration of the industry there.* Machinery can be easily imported into Bombay.

Outside Bombay city, Ahmedabad and Sholapur are also very important for cotton industry in the Bombay Presidency. Important factories are also found in the Central Provinces, Madras, Bengal and U. P. Ahmedabad has about 70 mills. Ahmedabad specialises in fine cloth and cotton yarns of higher counts.

The moist climate of Bengal is very suitable for cotton manufacturing. The only handicap seems to be the lack of raw cotton which has to be brought from long distances. The 22 cotton mills of the province are distributed as below :—

24-Parganas	...	...	...	9
Hoogly	...	...	...	4
Howrah	...	...	...	5
Dacca	...	...	...	2
Khulna	...	...	...	1
Nadia	...	...	...	1

Bengal is the most important consumer of cotton goods and large quantities have to be brought from other areas specially from Bombay. The local production is quite inadequate to meet local demand—Bengal produces about rupees five crore worth and consumes about rupees fifteen crore worth. The industry, however, seems to have a bright future as possibilities are being explored of cultivating medium-stappled cotton in some areas (more specially in the districts of Chittagong, Mymensingh and Tinpperah).

In U. P., the Ganges towns of Cawnpur and Hathras are more important. Agra also has some mills. U. P. uses a lot of cotton goods and offers great possibilities in this direction.

Coimbatore, Madras and Madura are important cotton centres in the Madras Presidency.

Delhi and Ludhiana (Punjab) are also quite important. The goods of Delhi Cloth Mills, one of the biggest mills in India, are used all over Northern India and also in some peninsular places.

*Credit and Banking facilities are available in Bombay on a larger scale than anywhere else in the country.

The following table shows the provincial details of the industry in a tabular form (1936 figures) :—

Province	Existing mills	Spindles	Raw cotton consumed
Bombay Island	} 220 (Presidency)	2.9 million	799,000 bales
Ahmedabad		1.9 "	349,000 "
U. P.	25	.7 "	156,000 "
Madras	35	1.3 "	321,000 "
C. P.	7	.3 "	...
C. I. Agency	...	.4 "	...
Bengal	22	.4 "	90,000 "
Punjab and Delhi	13	...	140,000 "

Although Bombay is now the home of cotton manufacturing the first mill was started near Calcutta in 1818. Bombay had its first mill in 1851. In about ten years there were over a dozen mills in the country and by 1880, the number had risen to 58 employing about forty thousand persons. In 1930 the Cotton Textile Industry Protection Act was passed. In 1933 a British Textile Mission (representing the Lancashire industry) visited India and concluded "an agreement relating to import duties on cotton goods and encouragement of the consumption of Indian cotton in Lancashire*. In 1934 a Trade Agreement was concluded with Japan by which a quota of 400 million yards was fixed for Japanese imports. A second Agreement was concluded with Japan in 1937. The progress of the industry under protection has been rapid. The profits of the year 1941 were five times those of 1928.

Trade. India has long been a huge importer of cotton goods. In 1904-5, she imported about 2,966 million yards of cloth. But with the gradual increase in the home production, the imports began falling, so much so that after the protection in 1930 they fell down to 882 million yards in 1931 and to 647 million yards in 1938-39. Most of our imports come from U.K. and Japan. Some superior cotton is also imported raw. In 1939 we imported about 540,000 bales of raw cotton from East Africa, Egypt, U.S.A. and Sudan. Foreign raw cotton is better and there has been a sort of competition with Indian cotton. Protection was, therefore, granted to the Indian cottons in March 1939.

We also export some of our cotton and cotton goods. The present war has given a push to our exports as many countries that used to depend on British, Japanese and American goods now get their goods from us. According to the Indian Textile Journal (Sept 1943), India exported a total of about 193 crore yards of cloth between Sept. 1939 and Nov. 1942. Our chief customers were:—

Palestine	...	77,659,559	yards
Iraq	...	99,907,734	"

*Known as the Modi-Lee. Agreement.

Ceylon	... 109,310,615	..
*Burma	... 264,416,987	..
Straits Settlements	... 102,937,707	..
Nigeria	... 112,244,299	..
Kenya Colony etc.	... 158,121,376	..
Australia	... 186,954,521	..
Egypt	... 91,919,564	..

Before the present war India used to export large quantities of piece goods, twists and yarns to Burma, Straits Settlements, Syria, Aden, Siam, Iraq, Arabia and French Somaliland. Our exports of raw cotton represent no less than 44 per cent of the total value of raw materials exported. U. K. and Japan were our best customers.

3. Sugar-industry. This industry though now very well developed in some parts of the country, is comparatively a very young affair. In 1932, before the passing of the Sugar Industry (Protection) Act, there were only 32 sugar factories in the whole of the country producing about 450,000 tons of sugar. Our sugar imports, mainly from Java, amounted to the colossal figure of about 940,000 tons per year in 1928-29. In about five years things had changed completely. India had become practically self-sufficient in the matter of sugar. We had about 136 sugar factories producing a bit below 1 million tons of sugar per year in 1937-38; and accordingly our imports had come down to less than 13,000 tons. In 1942-43 the number of factories rose to 151 producing over 1.3 million tons of sugar. The industry gives employment to about 50 lakh persons in a normal year—including both direct and indirect employees of the industry†. The severe earthquakes in Bihar in 1934 badly damaged the industry in that province but it soon grew up to normal.

It was pointed out in the section on sugar-cane that most of the acreage under this crop lies in U. P., Bihar and the Punjab. It is, therefore, only natural that most of the sugar factories be situated in these provinces. The United Provinces and Bihar produce about 80 per cent of the total Indian sugar. The presence or absence of coal does not very much affect the location of the industry. Wood fuel from the Tarai and the waste material of the cane (bagasse) are used as fuel. Abundant and cheap supply of cane is the only important consideration. The two provinces mentioned above have abundant production and consume about 80 per cent of the total factory consumption in India.‡ The following table shows the comparative position and growth of the industry since 1931.§

*Exports to Burma were stopped after Japanese occupation. They will now be resumed soon.

†Adarkar, *The Indian Fiscal Policy*, pp. 201-202.

‡The Indian factories crush about 22 per cent of the total cane-production.

§Gandhi, *The Indian Sugar Industry Annual—1943—Table No. 2.*

Japan	...	29
Egypt	...	29
India	...	20 (including gur—6·7 lbs. for sugar alone)

The production costs in India are about Rs. 7 per maund of sugar. Cuba sugar valued at 11 pies per lb. and Java sugar valued at 13 pies per pound are cheaper than India sugar valued at 19 pies per pound.*

Utilization of By-Products. Molasses present quite an important problem. Generally the farmer converts his molasses into low grade gur while the factories use them for the manufacture of alcohol. At present there are three major distilleries producing power alcohol.† Power Alcohol Acts have been passed in U. P., Bihar and Bombay. The Grady Commission discussed this question and orders for a number of plants were placed in August 1942. An advance in the production of power alcohol will certainly lower the cost of production of sugar. It is also suggested to use molasses for reclaiming alkaline land. Cattle food can also be made. Molasses can also be used for surfacing metalled roads. Cheap confectionery is also made from molasses. Sir John Russell in his report‡ emphatically suggests that molasses should be used only as cattle food. He suggests that molasses could be converted into yeast and added to grass and other green-fodder. The present supply of molasses is more than 500,000 tons as compared to 270,000 tons in 1930-31 (both including khandsari).

The utilization of bagasse is also important. It is the residue of fibrous matter remaining after the cane has been crushed. Most of it is used as fuel in factories. Investigations, however, indicate that it could be profitably used for the production of paper, purified cellulose and fibre board—a possibility that may further lower the cost of sugar production.

Trade. Both the imports and exports of sugar are insignificant. In 1931, before the protection, we used to import about 900,000 tons of sugar every year, while in 1937-38 the figures came down to 14,000 tons. In 1941-42 the imports amounted to 49,000 tons.

Our exports have always been insignificant. The maximum quantity ever exported was 93,000 tons in 1937-38. In 1941-42 the figures were 19,000 tons valued at about Rs. 32 lakhs. According to the decision of the International Sugar Conference, India can export sugar only to Burma.

4. Jute Industry. About 85 per cent of the jute acreage in India lies in Bengal specially in the eastern districts. Assam, Bihar and Orissa account for the rest. It is, therefore, only natural that the industry be also localised in that area. Most of the mills are

*As given by Dubey in his "India"—P. 165.

†At Meerut, Mandya and Nizamabad—producing 1·3 million bulk gallons.

‡Sir John Russell—"Report on the work of the Imperial Council of Agricultural Research"—Pp. 109-110.

located on the banks of the river Hoogly that supplies both water for factory use and facilities for cheap transport. Proximity to Calcutta provides import and export facilities. Coal is also quite at hand.

It is interesting to learn that although India enjoys a monopoly in jute; "the inception and development of the jute industry is due to foreign enterprise". It was in 1828 that about 364 cents of raw jute valued at 620 rupees were exported to Europe. The peasant weavers of Bengal used to make gunny bags etc. as a cottage industry but there was no trade of any significance. In 1832 it was suggested that it might be used as a substitute for hemp. Since then jute has rapidly gained in importance. By and by difficulties of bleaching and dyeing were overcome and the industry became an important member of the textile group. The first jute mill was started at Rishra (Serampore) in 1855 and the first power loom was introduced in 1859.

At present there are 107* jute mills in India producing about six lakh tons of gunny bags, 3.5 lakh tons of gunny cloth, 3,000 tons of rope and 2,000 tons of canvas. The area north of Calcutta, along the banks of the Hoogly, is the most important centre of jute manufacture in India; the area around Chittagong being the next. Bengal has 96 jute mills as compared to 4 in Madras, 3 in Orissa, 2 in U.P. and 2 in C.P. and Berar. The annual consumption of raw jute in the Indian mills is estimated to be about seven million bales of 400 pounds each. The balance of about two million bales is exported chiefly to U. K. and other European countries—U. S. A., Canada, Argentine and Australia also being some of the more important customers*. The present war has, however, drastically lowered our exports which in 1941-42 amounted only to about 8.6 lakh bales as compared to 24.6 lakh bales of 1937-38. Nearly all jute is exported via Calcutta. Raw and manufactured jute claims 50 per cent of the total exports of the port of Calcutta. Of the total Indian exports jute claims about 20 per cent.

On the whole the jute industry in India has made practically an uninterrupted progress till in 1930 when owing to a decrease in demand the industry faced a serious crisis. Its original out-turn was only 8 tons a day, while the industry has during its peak days touched 6,000 tons a day. In the earlier years† of the present century, Dundee in Scotland used to be the centre of jute manufacturing‡ and raw jute was sent there from Calcutta. Since then Calcutta has increased in importance.

After 1930 the demand and prices have both gone down considerably owing primarily to the introduction of several substitutes—

*Employing more than 300,000 workers per day.

†India exports about Rs. 30 crore worth of jute

‡Up to 1908,

¶The first jute mill was established there in 1838.

(a) New Zealand flax, (b) Sisal in Italy and (c) Sack-wool in Canada, (d) Paper bags of U. S. A., one of our most important customers. Some jute is produced in the Amazon valley where in 1943 about 9 million pounds were produced. The Government has, therefore, begun discouraging over-production of jute and advises farmers to grow more rice and sugar-cane.

Attention has also been given to researches in the cultivation and manufacture of jute. Research laboratories have been installed at Dacca and at Tollygunj. The Indian Jute Mills Association is the governing body of the industry. The Indian Central Jute Committee has been constituted by the Government to watch over the interests of all branches of the jute industry and trade. New uses of jute have been found out by research workers. Jute can be used for insulating materials, for roofing and for sheeting the walls. Jute cloth can be used for wire mesh in road making and in concrete structures. Carpets, curtains and upholstery can also be made. Blended with wool, cotton and silk, mercerised and bleached fibres could be had. With all these new possibilities the industry seems to have a bright future.*

(5) Paper Industry. The hand-made paper industry is an ancient industry in this country. It was only in 1867 that the first paper mill (Bally Mill) was started in India on the banks of the Hoogly. In 1879 the Upper India Couper Mill was started at Lucknow, the Titagar Mills were started in 1882 and the Deccan Paper Mill was started at Poona in 1887. In 1931† there were nine paper mills in the country. In 1940-41 fifteen‡ paper mills were manufacturing in India. The total output of paper in 1942-43 was about 100,000 tons. Bengal with its 6 mills heads the paper-making provinces. Bombay has 4, U. P. 2, Madras 1, Travancore 1, Mysore 1 and Hyderabad 1. Calcutta, Bombay, Lucknow, Saharanpur, Poona, Chittagong, Trivindrum, Rajahmundry and Jagadhri are the chief centres. Calcutta, however is the principal paper centre of India.

In India paper has hitherto been made from *sanai* grass and bamboo. *Sanai* grass is, however, expensive and according to Prof. Brij Narain "the future belongs to the bamboo and the paper pulp industry." The supplies of bamboo are almost inexhaustible. Bamboo abounds in Bengal and in eastern and northern areas of the country. The Forest Research Institute at Dehra Dun is carrying on research to find out a proper wood for the manufacture

*Jute Industry by Barker may be consulted for greater details.

†When the Tariff Board was appointed to consider protection to the industry. Earlier the Bamboo Paper Industry (Protection) Act had already given protection to writing papers and certain printing paper.

‡22 including smaller works.

§In a paper read before the Royal Society of Arts in 1921, Mr. Raith opined that our bamboo resources are so huge that including Burma, we could produce ten million tons of pulp per annum, an amount that could suffice for the whole world.

of paper pulp. We, however, do not possess some of the chemicals required for paper-making. Hence they (caustic soda, bleaching powder and dyes) have to be imported. This is a great disadvantage under which the industry is functioning. Heavy charges for coal have to be paid by all the mills except those in Bengal.

Newsprint is imported as it is quite impossible to make it locally. No cheap wrapping paper can be made in India. Expensive rag paper, art paper, tissue paper and other high class papers have all to be imported. Our mills, however, make some pasteboard, mill-board and cardboard.

We, however, still import large quantities of paper—about Rs. 115,67,000 worth in 1942-43. We import about 35,000 tons of newsprint*. Most of our paper imports come from the United Kingdom. Other countries involved are Norway, Sweden, Germany and Japan. The following table gives percentage shares of paper imported into India (1938-39).

U. K.	27.6 p. c. of total value of paper imported		
Germany	19.7	"	"
Sweden	12.0	"	"
Norway	11.6	"	"
Netherlands	4.7	"	"
Japan	4.1	"	"

The present hostilities have stopped a major portion of our imports and the industry has now got a good opportunity to improve and consolidate its position. If the vast forest resources of the Indian jungles could be fully utilized, the day is not far away when we have no need for any imports.

(6) Rubber. It is during the last fifty years or so that rubber plantations have developed in India in an unexpected manner. The Travancore State produces 80 per cent of the Indian crop. Other plantations are in Madras and Coorg. According to the rubber Cartel of 1939 (the International Rubber Regulation Committee) the rubber production in India was fixed very low. Consequently when Malaya was lost to the Allies, the production of Indian rubber was found to be very inadequate.

The total number of rubber factories in India is about 114† (1943). They are located as follows :—

Bombay	... 40
Bengal	... 30
Punjab	... 19
Hydrabad State	... 11
Delhi	... 6
Travancore	... 3

*India imported 46,100 tons of wood pulp used by Indian Paper mills, in the year 1938-39.

†Godbole, the Rubber Industry in India—p. 3.

‡Only 27 are, however, large concerns.

competition from Chinese and Japanese goods and as a protective measure recommended a specific duty of Rs. 2-6-0 per lb. on raw silk and cocoons for a period of five years ; and an increased duty of 83 per cent* on silk goods was also recommended to compensate the silk weaver for the thus increased cost of the raw material. The Indian Tariff (Textile Protection) Amendment Act of 1934 accepted the recommendations with some modifications. Owing to the "present position of uncertainty" the Government decided in 1938-39 not to consider, for the present, the recommendations of the Tariff Board for the continuance of protection.†

There is a great scope for the development of the industry. But owing to the poor financial state of the weaver, it is not possible for him, without official help, to purchase all the costly equipment required to produce better stuff.

Rayon is a chemical product‡ and is ordinarily inferior to silk in quality. It is largely mixed with cotton, silk and wool. Its best asset is its cheapness. The first artificial silk fibre was produced in 1884 and since then it has gradually worked its way up to a very respectable position and is now a serious rival of real silk. The world production of rayon is about 11,00,000,000, lbs. more than 80 per cent of which is produced by Japan, U. S. A., Germany and United Kingdom.

The industry is conspicuous by its absence in India but there is a very great demand for rayon—In 1938-39 about Rs. 500 lakh worth of artificial silk was imported. The presence of all the necessary ingredients in the country points to great future possibilities in this direction. Researches|| have indicated that *fibro*§ can be used for the production of rayon. Cotton and cotton waste can also be used for the same. The necessary chemicals are also locally available. This is one of the workable problems for post-war India.

9. Leather Industry. In the section on the livestock wealth of India, we hinted at the large number of cattle, goats and sheep we have in this country. It is, therefore, only natural that the leather industry should also claim some importance. The value of the entire industry is estimated at about 40 to 50 crore of rupees. India is a major supplier of hides and skins, both raw and half-tanned, in the whole world. The industry supports a large number of people and is truly an important factor in the economic well-

* On silk mixtures the duty was increased to 60 per cent.

† In 1940 protective duties were levied for 2 years.

‡ Manufactured from wood-pulp, sawdust, or cotton waste.

|| Most of the work is being done at the Forest Research Institute, Dehra Dun.

§ Made out of grass and bamboo pulp.

§ Report of the Hides Cess Inquiry Committee (1930). Para 158.

being of a vast majority of India's depressed classes (*chamars*). Fairly authentic estimates reveal that the production is as follows*:

Cattle hides	...	20	million
Buffalo hides	...	5 75	"
Goat and kid skins	...	28	"
Sheep and lamb skins	...	19	"

The industry is largely carried on as a cottage industry by 'chamars'. About 75 per cent of the Indian production of raw hides and about 45 per cent of the goat and sheep skins are now-a-days locally tanned, the remainder are exported. Modern tanning employs local tannings such as babul bark and myrobolams and they have been introduced in Cawnpur, Agra, Calcutta and Madras. Chrome tanning has also greatly developed at Cawnpur, Calcutta and Madras. The Govt. Harness and Saddlery Factory was set up at Cawnpore in 1867. Another important factory was set up at Bombay (Western Indian Army and Equipment Factory). In due course of time, more factories and tanneries were set up. Before the last war Germany was our best customer. After 1918 the United Kingdom replaced her. The war gave a big push forward to the industry. The Munitions Board encouraged the manufacture of many goods hitherto exported. In 1938 there were 14 leather and shoe factories employing about 6,736 persons daily, and 32 tanneries employing about 4,522 persons daily. Most of the factories are in Madras, U. P., Bengal and Bombay. Cawnpore in U. P. is the most important centre. Batanagar near Calcutta and Jallo near Lahore are equally important.†

The present war has given another push. Now there are 54 large leather factories and 20 large shoe factories. In 1943 the industry produced about 4,000,000 pairs of army boots. The total production was valued at Rs. 10,00,00,000. The industry supplies about 12,000 pairs of boots per month to the army. The total contract is for goods worth Rs. 100 lakhs‡. The growth of lamb and kid fur skins is another milestone gained by the industry. Leather belting and roller skins are also being manufactured now. Several hide grading stations have been opened. The govts. of Madras, Bombay and the Punjab have begun taking steps towards fostering this very useful industry. Taking into consideration the great demand for shoes and other leather goods in India, the industry is bound to have a bright future.

We have both large imports and exports in leather goods. In 1938-39, we imported leather worth Rs. 53,19,900, belting worth Rs. 22,92,800 and boots worth Rs. 11,24,430.

Our exports in 1939-40 are reported to have been (a) Rs. 412 lakhs worth of raw and undressed hide and skins and (b) Rs. 600 lakhs

*Wadia and Merchant, *Our Economic Problem*, p. 316.

†The Madras Tannery and the Western India Factory in Bombay are important, besides the Cawnpore ones

‡Economic Resources of India by Ghosh—p. 209.

limestone exists in many parts of India. Most of the factories are near the quarries, the longest distance over which limestone has to be conveyed is about 32 miles. Suitable clay is also plentiful. Gypsum is also had in the country. Fuel is carried to long distances in all cases except one and hence coal is a very serious item in the cost of production. Both the output and the price are controlled by a merger which came into force in 1936. Now the industry is working as a single organisation.

(b) The modern Glass Industry is an industry without a past * There are 41 very large glass factories in the country producing about Rs. 4,50,00,000 worth of goods every year. There may be an equal number of smaller factories. The industry in all employs more than ten thousand workers. The factory industry is mainly localised in the Indo-Gangetic basin, the chief centres being Allahabad, Naini, Baihjai, Sasni, Shikohabad, Ambala, Lahore and Calcutta. Bombay and Jubbulpore are other important centres. The industry is also carried on as a cottage industry. It chiefly consists of bangle-making. Ferozabad in U. P. is perhaps the largest bangle centre of India. Belgaum in the south is also important.

The local demand for bangles and other glass-ware is large and as such there is great possibility of improvement. We import about a crore rupees worth of goods mainly from Japan. We also export goods worth about Rs. 3 lakhs per year (1938-39).

As soda ash, an important ingredient has to be largely imported, the Government rejected the Tariff Board's recommendation for a ten year protection to the industry. The present war has helped the growth of the industry a great deal. The government of the United Provinces have paid particular attention to its development. A glass technology section has been established and a glass technologist has been duly appointed. Modern factories have recently been set up at Ferozabad, Benares and Ghaziabad. More are expected in the near future.

(c) The Tobacco Industry has long been carried on as a cottage industry in the country as 'chilam' tobacco and 'bidies' have always been popular. At present we have 185 factories in all, out of which 35 manufacture cigarettes and cheroots and 150 produce 'Bidis'. Our total production including cigarettes, bidis, cheroots, snuffs and hookah tobacco is about Rs. 45 crores worth per year. The cigarette factories which have been registered employ about 10,000 persons. The four most important factories are located at Calcutta, Saharanpur, Bangalore and Monghyr and it is estimated that they collectively produce about 75 per cent of the total Indian cigarettes. Indian

*E. Dickson says in his 'A Survey of Glass Industry' (1936) that glass industry has long been carried on as a cottage industry in the country. There is evidence of its existence in the 16th century. At Panipat there is a workshop more than 200 years old.

factories produce about 8,040 million cigarettes in a year and use about 22 million lbs. of tobacco leaf; good quality leaf amounting to over 15 per cent of the total used is imported chiefly from U. S. A.

Madras Presidency monopolises the production of cigars and cheroots. Cheroots valued at about 9 crores of rupees are produced in the country. Cigar production amounts to about 33 million in number.

Bidis are produced in huge quantities. It is estimated that India produces about 75,000 million bidis valued at about 8 crores of rupees. They are made almost everywhere but special varieties come from the South specially from Poona and Bhandara.

(d) The Match Industry is of a very recent growth. The Gujrat Islam Match Factory of Ahmedabad was the only match factory in India before 1921. Our imports in 1920 amounted to about 15 million gross boxes. Import duties and other taxes were increased on imported goods and the Indian industry went up quickly. Machinery had to be imported. In 1927, there were 27 match* factories in the country producing more than 18 million gross boxes annually.† The production increased to 24 million gross boxes in 1936 with a corresponding increase in the number of factories. Our consumption is high‡.

Calcutta is the largest centre for the manufacture of matches and the wood from the neighbouring forests is used. Bombay which is also an important centre uses imported wood. There are also some factories in Gujrat and the Punjab (Lahore).

About 60 per cent of the total production in India is controlled by a gigantic Swedish concern. The Tariff Board of 1926 did not distinguish between the Swedish Trust and the indigenous industry. The Western India Match Company is merely Indian in name and is controlled and financed by foreigners. Owing to the keen competition from this concern, many factories specially in Bengal had to be closed down.

(e) The chemical and paint industries are still in their infancy. Most of these products are still largely imported. About Rs. 3 crore worth of chemicals were imported in 1938-39§. Although potentialities exist, as yet only heavy chemicals are produced in the country. There are about 57 factories of varying descriptions producing about Rs. 3 crore worth of heavy chemicals. The following details|| of production may be noted :—

Coal Tar	...	80,000 tons
Soda Ash	...	56,000 "

* According to the estimates of the Tariff Board.

† Daily out-turn is estimated to be about 500 gross boxes.

‡ About seven match boxes per head per year.

§ Rs. 5 crores worth in 1942-43.

|| Ghosh, Economic Resources of India—p. 202.

Sulphuric Acid	... 30,000	„
Ammonium Sulphate	... 20,000	„
Caustic Soda	... 4,500	„
Chlorine	... 2,600	„

Most of the factories are located in Bombay, Calcutta, Delhi, Madras, Bangalore and Lahore.

Truly speaking the *paint industry* is a branch of the chemical industry. The first factory came into existence in 1902 at Goabaria (near Calcutta). The last war gave a great impetus to the industry. To-day there are 13 factories in the country. The imports have always been heavy—Rs. 13,00,00,000 worth in 1919, 20. It is only since 1937-38 that owing to the increased Indian production, imports have decidedly come down. In 1943-44, the production of paints was about 1,000,000 cents. The chief items produced are (1) Paste paints, (2) Mixed paints, (3) Dry colours, (4) Enamels and (5) Varnishes.

The present war has been responsible for the opening of a number of new factories—(a) at Khewra for soda ash, (b) at Rishra for bleaching powder and (c) at Port Okha for soda ash. The Tatas at Tatanagar manufacture a lot of sulphuric acid. The factories at Bombay, Calcutta, Madras, Lahore, Cawnpore and Mysore have more or less doubled their production specially of potash and bichromates of soda, ingredients which are used in the manufacture of *khaki* cloth for the army.

According to Mr. K. H. Vakil the slow progress of the chemical industries in India is due to “bad location, insufficient financial support, crude designs of plants, want of support from large consumers.”* With proper attention and better organisation, the industry could look forward to a bright future.†

(f) *The Soap Industry* is about a century old. To-day, however, we have about 120 factories employing 1,838 workers and producing soap worth Rs. 4,00 00,000 per year. Conditions for the manufacture of soap are quite favourable in India. Large quantities of vegetable oils are available; only caustic alkalies have to be imported. The Tata Chemical Company, the Lever Brothers and the Modi Manufacturing Company are the three largest concerns.

Bengal‡ was the first to start making of cheap dhobi soap. Meerut was the first to have a modern scientific soap factory. The last war was responsible for the starting of a number of factories. It was, however, after 1930 only that a real increase in factories and production came into being. Besides, the number of factories given, there are many small concerns manufacturing cheap dhobi soaps. About 40 per cent of the production is controlled by Lever Brothers, a foreign firm now operating within the country.

*Vakil, *The Heavy Chemical Industry—Indian Finance* (Eastern Group Number)—p. 47.

†We will have to import some raw materials.

‡Dacca soap is about a century old.

(g) **Tea Industry.** In 1939-40 India produced about 453 million pounds of tea, more than half of which was exported. Tea industry is an important empire industry with £100,000,000 capital investment and representing a combination of agriculture and industry. There are about 5,000 tea plantations, the bigger ones being in Assam. Tea is prepared for the market in the factories that are situated within every important tea garden or group of gardens. There are many very well-equipped factories specially in Assam. The industry employs more than 1,000,000 workers.

As foreign exports show a decline, greater internal consumption is required. The Indian Tea Market Expansion Board is carrying on extensive tea propaganda within the country. An average Indian uses $\frac{1}{2}$ lb. of tea per year as compared to 11 lbs. used by a Britisher.

(h) **Lac Industry.** India produces about 50,000 tons of lac yearly, more than 90 per cent of which is exported to U. S. A. and U. K. Chhota Nagpur, Bengal, Central Provinces and U. P. are the chief lac producing provinces. The chief centres of the industry are (a) Ranchi, Palamau, Manbhum and Singhbhum in Bihar; (b) Maldah, Murshidabad, Birbhum and Bankura in Bengal; (c) North-eastern districts of C. P., (d) Mirzapur in U. P. and (e) the Feudatary states of Orissa. About 300 tons of lac are used in India for the manufacture of gramophone records*. Lac is also used for polishing furniture and for the manufacture of bangles, insulating material, sealing wax etc.

The Indian Lac Research Institute was opened in 1925 at Namkum (five miles from Ranchi in Bihar) to find out new openings for lac in India and to improve the cultivation of lac and to fight the insect enemies of the commodity.

In the end it may be remarked that lac is secreted by an insect (*Lacaifer Lacca*) on certain trees. When refined it is called *shellac*.

(i) **Oil Milling.** Though India produces a variety of oil-seeds, her oil industry *i. e.*, making of refined oil, oil cakes etc. is not appreciably developed. She is mainly a seed-exporting country. Our methods of oil-crushing are crude and the final product is highly impure and coloured. We export a huge quantities of oil-seeds (and not oil) a fact which is industrially as well as commercially unsound†. About $\frac{1}{4}$ th of our exports go to U. K. The value of oils exported is about £269,000 (1935-36) per year. A good quantity of oil is consumed internally in its raw and crude form and at many places it is used for ghee and butter.

The oil-milling industry was given a great stimulus by the last Great War and the production of many oils went up tremendously.

*30 to 40 per cent of the world total is used for making gramophone records.

†We not only lose manufacturer's profits but also a large amount of oil cakes which can be used as cattle food as well as a good fertilisers.

Now there are about 500 big mills and about 1,000 smaller institutions. Besides, every village has its own bullock-run crude sort of crushing machinery.

While concluding this section, it may not be out of place to make a mention about some miscellaneous items like machine tools, sailing vessels, air-craft etc., although the manufacture of those items is very recent and very meagre.

By the end of 1941, about 100 firms of all descriptions had been registered for the manufacture of machine tools and simple machinery*. About 5000 items of small tools are now prepared in the country. A number of items required for defence and A. R. P. equipment are also made within the country. Fire-engines and armoured steel plates are also being made. Steel of various kinds, e.g., alloy for guns, acid steel etc., are being made in the country now.

Small beginnings both in the manufacture of small vessels and air-craft have been made. There are also fair prospects for quite a flourishing automobile industry as the demand for and the consequent import of motor vehicles is tremendous; and the after-war requirements are bound to be greatly increased.

The ship-building industry is more or less absent in India except for the manufacture of small naval vessels, prismatic glass,† opal shade lamps and anchors. Calcutta and Vizagapatam have some ship-repairing yards that make hulls and lighter crafts‡. Vizagapatam is specially suited for the purpose because primarily of its central position on the eastern coast. The presence of a deep-water harbour and of a good tidal range are additional assets. The Gondwana coal-fields are also situated nearby. Other ports like Karachi and Bombay are away for coal. Madras has a shallow artificial harbour. More attention is urgently needed on this question as our share of shipping is even less than 2 per cent.

The condition of the air-craft industry is equally deplorable. The Hindustan Air-craft Company at Bangalore is yet only an assembly plant. A repair shop has recently been added to it.

The question of starting an automobile industry was first considered in 1934 on the suggestion of Sir M. Visveswarya. But the Government, though verbally sympathetic, did not give any substantial encouragement. India imports motor vehicles and cycles, etc., upto the value of about rupees five crores and even then she is very backward in this respect.§

Jamshedpur, Calcutta and Burnpore are suitable centres for the industry as all facilities in the shape of raw material and coal

*Lokhnathan, Industrialisation—p. 13.

†Ibid. p. 14.

‡The Scindhia Steam Navigation Company has recently started a ship-building yard at Vizagapatam.

§One motor car in India serves about 2,000 persons, while corresponding figures for U. S. A are 4, for Canada 8, and for U. K., 20

exist there. It is opined in many quarters that it is impossible to have the industry as many parts and accessories cannot be produced in India. It is not a very discouraging factor as according to experts there is not even a single country where an automobile plant is all-producing and self-sufficient. Some necessary items could be easily imported. The Hind and Hindustan cycles have made a good start, in spite of the fact that half of a cycle is made of imported stuff. Tyres and tubes are already being made locally.

(k) The *Film Industry* is a very young enterprise. It entered the 25th year of its life in 1939. It has, however, developed very rapidly. It employs more than 15,000 persons including artists, photographers, technicians, etc. It yields about 2 crores of rupees as Government revenue. It is, however, a pity that nearly all the raw film, cameras, etc., have to be imported. Cinema projectors also come from abroad. There are about 150 film-producing companies, although only about 30 or 40 have their own studios. There is bound to be a great development in the industry now that the hostilities have ceased on all fronts.

COTTAGE INDUSTRIES*

Cottage industries occupy a definite position in our economy. India is a land of villages, and poverty is the chief problem of these villages. Cottage industries present one good way of increasing the purchasing power of the villager as well as a good use of the leisure as subsidiary to agriculture. It is, however, a pity that we have been neglecting them and they are now rapidly declining. It stands to reason, therefore, that immediate steps be taken to resuscitate them. It may be of some interest to know that it is the small-scale industries that helped China to resist Japanese aggression.

No definite estimates and information are available about the nature and location of cottage industries. Rough estimates indicate that from 12 to 15 million persons are engaged in these industries. Hand-spinning and weaving is the most important branch although the machine competition has tremendously pushed it down. Carpets and rough blankets are the chief items of production. Embroidery, furniture-making, basket-making, gold and silver thread, toys, pottery and metal and cutlery as well as shoe-making are other important branches that are followed.

In the United Provinces (a) *papier machie* is carried on in Burdaun; (b) Carpets are made at Amroha and Moradabad, Bareilly and Mirzapur, (c) silk goods and embroidery is famous at Benares, Amroha and Agra; (d) the brass-ware industries flourish at Moradabad.

*In writing this section we have made use of (1) 'Cottage industries And Their Role in National Economy,' by Prof R. V. Rao and (2) Prof. Brij Narain's *Indian Economic Problems—Part I* PP 103-107.

In Bengal blacksmiths abound everywhere making ploughs, cart tyres and locks. The western districts carry on some blanket-making. Cotton, jute and silk weaving is carried on almost everywhere.

In Madras the cottage industries are in a disappearing state. Bangle-making, paper goods, tobacco goods, toys, and wood work may be mentioned as important.

The Punjab being the most important agricultural province, is also very important in the matter of cottage industries. Cotton spinning and weaving, woodwork, iron things, leather tanning and embroidery may be mentioned as the foremost items in this connection. Sialkot is important for sports goods and Hoshiarpur for wooden toys and things.

Poultry is being tried in many village centres of the country. Bee-keeping is another cottage industry which is slowly getting established. It is very important in the northern hills and in Travancore where there are about 2,000 hives each yielding about Rs. 10 worth of honey every year*. Gur-making and hand-pounding of rice are also extensively followed in relevant regions. Hand-spinning and weaving, however, remain at the top and yet there is great scope for development. Handloom weaving at present employs about ten million people and produces about 2000 million yards of cloth†.

It is gratifying to learn that attention is being paid to this very important problem in almost all the concerned quarters. The provincial Governments are increasingly granting loans for their development under the State Aid to Industries Acts. The All-India Village Industries Association was established in 1935 under the auspices of the Indian National Congress and it has since done much in this direction. With the increase in the use of electricity, a number of new village industries are likely to develop and many of the old ones may rapidly move forward.

THE FUTURE OF INDUSTRY†.

The Fiscal Commission (1921) opined that, "The industrial development of India has not been commensurate with the size of the country, its population and its natural resources, and that considerable development of Indian Industry would be very much to the advantage of the country as a whole." The industrial production per capita is about Rs. 12, a figure that stands disgracefully low when compared with similar figures for some of the more important foreign countries like U. K., Canada and U. S. A.

The things need go up rapidly. The main objectives of all future plans should be :—

- (1) Removal of our technical and economic backwardness.
- (2) Transformation of India into an important industrial country.

*Appasamy Our Main Problem —p. 24.

†The Economics of Indian Agriculture by Narayanswamy and Narasimban —p. 444.

‡An abstract of this chapter is being published as an article.

(3) Technical reconstruction of Indian agriculture.

(4) To raise the standard of living.

Finding of finances is the first question. Capital invested in India on large-scale industries is very small—about Rs. 700 crores, while in U. K., it is Rs. 7,067 crores and in U. S. A., it is about Rs. 23,000 crores*. But finances can always be managed, only if there is the will. Public loans, similar to war loans, could be easily floated for the expansion of industries.

Generally speaking India has quite an abundance of industrial raw materials as was made clear in the chapter on Minerals. Our reserves of iron and manganese are big enough to be called 'vast'. Our power resources are in no way mean. Water-power is plentiful if only carefully exploited.

The chief drawbacks are :—(1) lack of education (2) lack of enterprise, (3) lack of suitable labour, (4) lack of cheap transport, (5) lack of sufficient official encouragement† and (6) lack of sufficient protection against foreign imports.

The present war has, however, "tended to break down the traditional policy of *laissez-faire* towards Indian industrialization" and as a result some industrial development has taken place in the country. But the question is whether this healthy state of affairs will be allowed to grow or will it relapse into a state of stagnation? Dr. P. S. Lokhnathan stresses that besides other things, this involves "a definite acceptance of new obligations by the state."

To a geographer the 'location of industries' is of paramount importance. Our industries to-day are distributed very haphazardly. The question entails an official enquiry on the lines of the enquiries made by the Royal Commission of 1937. The Memorandum on the "Geographical Factors Relevant to the Location of Industry" submitted by the Royal Geological Society to the above-named Commission, is a document that may be usefully studied by those responsible for industrial planning in India.

The Bombay Plan proposes‡ to increase our national income through industrialization. It goes into all the aspects of the question and is as such worth consideration. It is however, interesting to note what Prof. Brij Narain, a famous economist has to say about it :—Both of us are agreed that the Bombay Plan is workable under assumed conditions. Both of us are agreed that the plan will never be tried. Planning in India requires dictatorship or 'democracy' of the Russian type.§

The Peoples' Plan expresses the views of labour on this question. It lays more stress on the mechanisation of agriculture as it is believed that "an attempt to increase the income of the people will

*Bhoopalkar, India, Retrospect and Prospect—p. 24.

†Time and again it has been officially declared that this country should depend mainly on agriculture for a long time to come.

‡Sponsored by a number of Bombay industrial capitalists.

§Brij Narain, Indian Economic Problems—Part II.—Preface.

have to start through concentration on agriculture." Industries have been relegated to a secondary position and provision has been made for a very vast state control.

The Department of Planning and Development of the Government of India has also brought out a plan for the industrialisation of the country. The plan recognises the great necessity for "an intensive development of industries in India" because the Government of India feels that "it is only by such development that balanced economy can be achieved." The plan has been rightly split up into two parts, (a) a short-term plan and (b) a long-term plan. The former is meant for laying the background and setting up of the machinery in the right order, while the latter involves some "large-scale capital expenditure" including setting up of heavy industries and the improvement of means of transport.

On the 21st of April 1945, the Government of India issued a "Statement on Government's Industrial Policy." Therein it has been made clear that after legislative sanction the Government are taking over some of the heavy industries including iron and steel, aircraft, ship-building, textiles, cement, sugar and coal. They have a scheme of "Government assistance to industry" and of "licensing of industry."

If sincerity and not mere window-dressing, is the basis of all this activity, we should pitch our expectations high.

CHAPTER XI

TRANSPORT AND COMMUNICATIONS

..."Transport is essential to that standard of individual consumption which we regard as the hall-mark of civilisation, and the command of rapid and comfortable travel is itself regarded as an indispensable part of culture....."—M. R. Bonavia.

Our transport has always been governed by geographical and socio-economic factors in the various areas at different stages. During the few decades gone by, India has become the epitome of all classes of transport—the pack animals ply in the deserts and in the mountains; the indigenous bullock-cart serves the agricultural countryside where good roads are unknown; the country boats and crafts move up and down the alluvial water-courses; the railways have tried to link up as many places as possible; motorable roads are being increasingly used by an ever-increasing fleet of motor

vehicles ; and the aeroplane also occupies quite a respectable position. Our railway mileage is about 41,000* miles ; our roads measure about 74,000 miles of metalled and about 2,26,000 miles of unmetalled roads ; we claim more than 200,000 automobiles and our air routes are estimated to be about 7,000 miles. We also claim about 3,800 miles of navigable waterways. The picture thus painted is not bad but looking at the vast size and population of the country, the statistics dwindle into comparative insignificance. Extensive future plans have been chalked out and the next few years may see a huge increase in our transport facilities.

Organised transport came to be introduced in India in the latter years of the 19th century, but most of the development was effected during the first 30 or 35 years of the present century. Until the middle of the 19th century, however, transport was mainly conducted by means of pack-animals, palanquins, bullock-carts, small river-crafts and small sailing boats that could go only to nearby places on the sea-coast†. Lord Bentick's attempt to improve road transport was perhaps the first serious attempt at transport development by the British. It was, however, only during Lord Dalhousie's time‡ that an all-round development took place. The Public Works Department was established, roads were improved, postal services were developed and railways were introduced in the country§.

By about the beginning of the 20th century things had gone far ahead. The country had about 25,000 miles of railways ; 37,000 miles of metalled roads and 136,000 miles of unmetalled tracks and roads ; Postal and telegraph services were functioning efficiently ; and shipping and port facilities were placed at a comfortable position. The latest figures already given earlier show a tremendous increase in these facilities.

Our transport system consists of (1) Railways ; (2) Roads ; (3) Aerial transport ; (4) Inland Waterways : and (5) Coastal and ocean shipping. Other facilities include post and telegraph services, the radio and telephone. The geographical distribution, nature and direction of the means of communications in India are largely controlled by physical conditions of the country. "Since communications follow the line of least resistance," their preponderance in the northern plains is only natural and expected. The northern highlands offer very poor facilities for the construction of roads and railways. The conditions in the Deccan are also not very adequate. It is, therefore, only right that about 50 per cent of the roads and railways are found in the Indo-Gangetic plains. And the same is the case with telephone and telegraph lines as will be seen from the details that follow in these pages.

*In 1931-32 we had about 42,753 miles ; 41,000 miles are due to a number of branch lines having been dropped during the war.

†Vera Anstey, *Economic Development of India* (1942)—p. 128.

‡Lord Dalhousie was head of the Indian Government from 1848 to 1854.

§Hanter, 'Dalhousie' p. 11.

1. **Railways.** Indian railways have had a chequered career. Their expansion has been mainly controlled by economic requirements while their distribution has always depended on the relief of land as is clear from the railway map of the country. The northern plains have perhaps the densest net-work of railways in the country while the northern highlands and the southern plateau are served in a much lesser degree.

The first Indian railway was opened on the 18th of April 1853*. It ran from Bombay to Thana (21½ miles) and was owned by the Great Indian Peninsular Railway. By about 1880, the country had about 9,000 miles of railways. Rapid construction followed and in 1890, the mileage came up to about 164,04 miles. In 1910 it stood at 32,099 miles; in 1920 at 36,735 miles and in 1931-32 at over 42,000 miles. More than 110 crores of passengers and more than 9 crore tons of goods were carried by the Indian railways in pre-second Great War years. In normal times about 5 per cent or more is the railway contribution to the general revenue of the country†.

Throughout the country there are 3 gauges :—

(1) Broad-Gauge (5'-6")	20,000 miles‡
(2) Metre-Gauge (3'-3¾")	16,000 miles
(3) Narrow-Gauge (2'-6")	4,000 miles.

Railways have been divided into three classes :—

(a) Class I consists of Railways (36,862 miles) with gross earnings of Rs. 50 lakhs and over a year. :—

Railway	Mileage
East Indian Railway	4,106
Assam, Bengal Railway	1,309
Oudh, Tirhut Railway	2,010
Bengal, Nagpur Railway	3,380
Bombay, Baroda and Central India Railway	4,482
B. and A. Railway	2,147
Great Indian Peninsular Railway	4,106
Jodhpur Railway	1,125
Madras and Southern Maratha Railway	2,939
Mysore State Railway	728
Nizam State Railway	1,359
North Western Railway	6,814
Rohailkhand and Kumaon Railway	569
South India Railway	2,348.

*Between 1850 and 1868 the initiative came from private companies. Then a programme of direct state constructions was undertaken in 1869. (The E. I. R. Co. and the G. I. P. Rv. Co. were the first companies floated for the purpose). Then in 1879 once again help of the private companies was resorted to. Now nearly all the railways are owned or worked by the state.

‡Hindustan Year Book, 1945, pp. 70-72.

†Morces and Stimson, Introduction to India, (1943), p. 144.

(b) Class II consists of railways with gross earnings between 10 and 50 lakhs per year (2,521 miles). In this the most important lines are :—

(a) Baisi Light, (b) Bengal Dooars, (c) Bhavanagar State, (d) Bikaner State, (e) Baroda, (f) Jamnagar, (g) Shahadra-Saharanpur.

(c) Class III consists of those whose yearly gross earnings are Rs. 10 lakhs and under (1,094 miles) ; amongst the more important lines in this class are :—

(a) Ahmedpur-Kawa, (b) Sasaram Light, (c) Bankura-Damodar River, (d) Bengal Provincial, (e) Cutch State, (f) Gwalior Light, (g) Porbandor state and (h) Udaipur-Chitorgarh.

From the point of view of their economic importance and utility railways have been classified as under :—

(1) Commercial Railways are constructed to stimulate trade and industries. Most of the Indian railways fall within this category.

(2) Protected Railways are constructed with a view to mitigate the evil effects of famine.

(3) Strategic Railways are meant to defend the frontiers of India and employed mainly for moving troops.

As has already been mentioned in the chapter on "Power Resources", Indian railways have a very small mileage of electrified railways. Only about 5 per cent or about 237 miles have been electrified. This compares very badly with similar figures in other countries as shown in the following table (as quoted by Dubey) :—

Switzerland	50 p. c. of total
Italy	28 "
Sweden	21 "
Germany	5 "
U. K.	5 "
France	4.8 "

At this stage it may be useful to learn a few details about some of the more important railway lines of India.

1. The North-Western Railway system serves the Punjab, Sindh, N. W. F. P., Baluchistan, and a portion of western U. P. and Delhi. It is both the largest and the longest railway system in the country and as has been given before its total mileage is about 7,000 miles. It has a huge traffic in wheat and salt. The system serves the hinter-land of Karachi, the only outlet of North-West India. In its initial stages of construction, a good portion of the system was meant for military traffic. It is connected with Khyber (Pass) Railway which has a length of about 27 miles and goes through 32 tunnels. Branches also go to Thal and Bannu. In Baluchistan services exist upto Chaman (double line) and Zahidan from Quetta.

There are two main lines, (1) that runs from Delhi to Peshawar *via.*, Saharanpur, Ambala, Lahore and Rawalpindi (another route connects Delhi and Lahore *via.*, Bhatinda and Ferozpur,) (2) that runs from Delhi to Karachi *via.*, Lahore, Multan and Hyderabad.

A branch line connects Bhawalpur with Peshawar. Yet another branch line connects Delhi with Ambala *via.*, Panipat and Kurukshetra. Other important branch lines are : (a) Wazirabad to Jammu *via.*, Sialkot ; (b) Ambala to Patiala, (c) Ambala to Kalka and then to Simla (rail-motor from Kalka).

2. The East Indian Railway is the busiest in India and its annual earnings are about 17 crores. The system serves the entire Ganges plain stretching in the three provinces of Bengal, Bihar and U. P. It is connected with the B. A. Railway at Naihati, with the B. N. Railway at Asansole and Gomah and with the B. N. W. Railway at Patna and Bhagalpur. The G. I. P. meets it at Cawnpore, Allahabad and Jubbulpore, and the N. W. R. at Delhi and Saharanpur. The East Indian Railway has played a very important role in the agricultural and mineral development of India as it serves places important for both. It handles most of the Indian sugar-cane, jute, coal and mica.

There are two main lines (a) from Calcutta to Delhi and Ghazialbad *via.*, Moghalsarai, Cawnpore and Aligarh ; (b) from Calcutta to Saharanpur and Dehra Dun *via.*, Patna, Lucknow and Moradabad. A shorter route exists between Asansole and Mughalsarai and a loop line exists between Mokameh and Khanva. Another shorter route connects Howrah with Burdwan.

Important branches exist between (a) Aligarh and Barielly, (b) Lucknow and Allahabad, (c) Lucknow and Cawnpore, (d) Chandausi and Moradabad, (e) Agra and Tundla, (f) Allahabad and Fayzabad.

3. The Great Indian Peninsular Railway is perhaps the oldest line in the country and serves a portion of the Bombay Presidency, Central Provinces, Central India, and a portion of southern U. P. and Hyderabad. Bombay which is now the chief port of the country gets nearly all its passenger as well as goods traffic through this line. The cotton areas of Berar and Khandesh etc. fall within its control and as such it carries the largest amount of cotton in the country. It meets the N. W. R. at Delhi—a line goes to Lahore *via.* Bhatinda ; the E. I. R. at Jubbulpore and Cawnpore ; and the M. S. M. at Raichur. The system has about 181 miles of electrified railway, and incidentally this represents the highest percentage in India. Fifty million passengers and eleven million tons of goods are carried every year.

Four main lines in all radiate from Bombay, (1) Bombay to Delhi ; (2) Bombay to Allahabad ; (3) Bombay to Nagpur (continued to Calcutta) and (4) Bombay to Raichur.

Amongst the branch lines, the more important lines are (1) Jhansi to Cawnpore (and Lucknow); (2) Bhopal to Ujjain; (3) Nagpur to Jhansi; and (4) Bina to Kotah.

4. The Madras and Southern Marhatta Railway serves quite a rich and fertile portion of the Indian peninsula. The Central Provinces, Madras and Mysore fall within its jurisdiction. The railway has a good traffic in grain, cotton, oil-seeds, salt, sugar, tobacco, timber and hides. It is a connecting link between Madras and Bombay in the West, and between Madras and Calcutta in the North-East. Along with Hyderabad Railway and the G. I. P., it links Madras with Delhi and other northern places.

All the main lines radiate from Madras, (1) Madras to Waltair *via* Bezwada; (2) Madras to Raichur; (3) Madras to Bangalore and (4) Madras to Poona (meter-gauge after Guntakal).

The more important branches are (1) Guntakal to Bezwada; and Masulipatam; (2) Madras to Arkonam; (3) Hubli to Sholapur and (4) Guntur to Repalla.

(5) The Bombay, Baroda and Central India Railway serves the rough and drier parts of the country *i.e.*, portions of Rajputana and Bundelkhand (U. P.), Central India and Malwa Plateau and portions of northern Bombay. The main line going from Delhi to Bombay *via* Kotah, Ratlam, Baroda and Surat provides "the shortest and quickest route between the two places (Frontier Mail Route). An extension of the line goes upto Lahore and Peshawar. Important branch lines in the Broad Gauge system are (a) Surat to Jalgaon, (b) Baroda to Ahmedabad and Kharagodha, (c) Agra to Bayana and (d) Nagdah to Ujjain.

In the meter gauge system the more important lines run (a) from Delhi to Ahmedabad *via* Ajmer and Marwar, (b) from Kasganj and Bharatpur to Bandikui (c) from Bandikui to Agra (d) from Kasganj to Cawnpur.

Out of the total mileage of railways, about 31,000 miles are state-owned and about 2,300 miles are worked by the state. The rest are private lines like the Jodhpur and Nizams railways. The present war saw a decrease of about 600 miles, but very soon the figures will come upto normal.

Compared to our 41,000 miles, the following figures for some other countries may prove interesting.

U. S. A.	250,000	miles
U. S. S. R.	52,000	"
Canada	44,000	"
Germany	36,000	"
France	27,000	"
Great Britain	23,000	"
Japan	14,000	"

But perhaps mere mileage figures do not give a correct idea of the position of railways in a country. It is a more useful method to study them in relation to the area and population served. The following two tables are quite useful ;—

A
Mileage every 100 sq. miles of area.

India	2·2	Miles
Belgium	40·0	"
United Kingdom	20·0	"
Germany	20·0	"
U. S. S. R.	1·5	"

B
Mileage per 100,000 persons.

India	11	Miles.
Canada	465	"
U. S. A.	224	"
U. K.	46	"
South Africa	164	"

To have a correct picture, India should be compared with U.S.A. It is twice as big and has more than a quarter million railway miles, and her population as well as area figures are much higher than those of India ; as such it is clear that we should have more railways. India is an agricultural country. Her industries are bound to go up. And then like U. S. A., India is a country of fairly long distances as is clear from the following table :—

Distances By Rail (In Miles).

To	From		
	Bombay	Calcutta	Madras
Agra	835	790	1239
Ahmdabad	306	1328	1100
Ambala	984	1025	1481
Bombay-	—	1223	794
Calcutta	1223	—	1032
Chittagong	1586	363	1395
Delhi	845	902	1361
Hydrabad (Dn).	491	987	3·3
Karachi	988	1571	2900
Lahore	1158	1199	1668
Madras	794	1032	—
Peshawar	1446	1463	1956
Quetta	1306	1889	2336

More important than the rail distances of places, is the number of hours a train takes to reach there. Thus a fast train from Bombay reaches Agra, a distance of about a thousand miles, in about twenty hours. The same journey used to take more than two months by bullockcart. A slow passenger train takes about 18 hours to reach Saharanpur from Allahabad, a distance of about 500 miles :—The following table gives some other approximate times.

From Calcutta to Bombay	36	hours.
" " Peshawar	48	"
From Bombay to Peshawar	48	"
From Bombay to Madras	24	"
From Madras to Peshawar	60	"
From Lahore to Karachi	30	"

All plans, government or private, regarding post-war economic development of the country, have emphasised a considerable increase in the mileage of railways of India. The Bombay Plan for instance, aims at an increase by about 50 per cent in the Present mileage during, say, next twenty years or so. The Basic Plan of the Railway Board also provides for a number of objectives including construction of new lines, regrouping of railways and the establishment of repair houses as well as for the manufacture of locomotives, wagons etc. The Government intend spending about Rs 319 crores in the first seven years of the post-war period. Electrification (of railways) would also seem to be a desirable long-term objective for areas with a great traffic density and for certain mountainous regions, specially if power development projects in connection with industrialisation are effectively carried out.* The Government intend constructing 500 miles of railways per year.

India to Europe by Rail Linking India and Europe by railway has now become very possible. Mr. S. G. Bounce suggests† "that the shortest route would be via Zahidan, Dizful, Baghdad, Aleppo and north across Turkey to Bosphorus."

For more than fifty or sixty years, this possibility has been discussed by a number of European countries. The Germans were the first to construct a line running to Scutari on the Bosphorus facing Istanbul (or Constantinople as known then). Then came the line to Baghdad. Gradually the line was extended to Aleppo (across the Taurus) and Nisibin (beyond the Euphrates). Then during the Great War of 1914-18, a line was pushed up from Baghdad to Samara; but things rested at that as the Germans were expelled from this part of the country.

In 1911 the North Western Railway in India extended upto Quetta and Nushki about 100 miles away towards the Iranian Boarder; while the Russians had extended upto Julfa on the Russo-Persian Frontier, and later on to Tabriz. In the north, the Russians had reached Tashkent in the heart of Southern Asia.

*Sarkar, Economic Policy and Programme for Post-war India (1945)—P. 84.

†Illustrated Weekly of India, 3rd Sept, 1945—p. 13.

Another line was soon built from Bandar-Shahpur in Iraq to Dizful, Teheran and to Bandar Shah on the Caspian. The completion of the Trans-Persian system was another step forward.

The World War II which has just ended, again turned attention to the age-old problem of *India to Europe by rail*. The Indian railway has been pushed to Zahidan and the Basra to Baghdad line has been pushed further north. Let us see what happens next, but the shortest and the quickest route can only be as mentioned earlier.

(2) ROADS.

The great importance of roads in a vast agricultural and commercial country like India, can hardly be exaggerated. It is, therefore, very unfortunate that our road mileage is meagre when compared with the size and the great transport requirements of the country. Our roads have not been built on a comprehensive plan. Like the old Roman roads, they were primarily built for military purposes. Ours are mostly trunk roads and the earliest was built by Sher Shah and runs from Peshawar to Calcutta *via* Delhi.

The length of existing roads* in British India is about 300,000 miles; of these 74,000 miles are metalled and 226 000 miles are unmetalled. The roads are the principal feeders of railways and about half of the railway mileage is paralleled by metalled roads. As is only natural, more than two-thirds of the total road mileage lies in the Indo-Gangetic plains. The following table shows provincial mileages :—

Province.	Metalled	Unmetalled	Total
Bengal ...	3,887	87,305	91,192
Bihar ...	4,015	31,144	35,160
U. P. ...	8,200	23,389	31,589
Punjab ...	4,378	20,764	25,142
Assam ...	692	10,379	11,071
Sindh ...	263	11,439	11,702
Orissa ...	2,023	2,772	4,775
Bombay ...	11,139	8,437	19,571
Madras ...	21,441	14,276	35,717
C. P. and Berar ...	5,469	3,193	8,662
N. W. F. P. ...	1,077	2,844	3,921

Roads in India can be classed as Trunk, Main, District and Village roads. At present there are four great Trunk roads with which most of these roads are linked. The four of them together measure about 5,000 miles. The most important of these is the

*Besides several million miles of inter-village kutchra roads in rural areas. Total for All-India is about 350,000 miles.

Grand Trunk road that runs from Jamrud to Calcutta, stretching right across the northern plains, going *via* Benares, Allahabad, Delhi and Peshawar. The three others connect 'Calcutta with Madras, Madras with Delhi and Delhi with Bombay. Most of these roads are more or less wholly metalled and open practically throughout the year. But even these according to the highest western standard, are in no way "safe, all-weather trunk roads." The important trunk roads in the provinces are maintained from provincial revenues (through Public Works Department), and the local roads are maintained by the District and Municipal Boards.

If we compare the road mileage of India with its great size and population, we shall come to the conclusion that our roads, especially of the better type, are too few and are quite insufficient for our needs. The following tables are quite illustrative.

Table I

Roads per 100 sq. miles of area.

Bihar (and Orissa)	... 35 miles.
U. P.	... 33 "
Punjab	... 23 "
Bombay	... 21 "
Madras	... 19 "
British India	... 15 " (very roughly.)
Whole India*...	... 5 " "

Table II

A comparative study of road miles per sq. mile.

<i>British India</i>	... 0.18
Japan	... 3.00
U. K.	... 2.00
France	... 1.90
Germany	... 1.20
U. S. A.	... 1.00.

Table III

Road Mileage per 1,000 sq. miles.

<i>British India</i>	... 49
Japan	... 2,029
Great Britain	... 1,900
Germany	... 1,900
France	... 1,900
U. S. A.	... 1,032
U. S. S. R.	... 204
Australia	... 157
Canada	... 118

*Only 1 mile of metalled roads to every 23 sq. miles of area.

Table IV.

<i>Roads per 1,00,000 persons</i>	
<i>British India</i>	... 142 miles
U. S. A.	... 2,853 „
France	... 1,392 „
Japan	... 684 „
Germany	... 565 „
U. K.	... 277 „

An ambitious plan to serve India with better roads and many more roads, should at once be prepared. We need about 3 million miles of good roads if we wish to compare favourably with Great Britain. Sir Kenneth Mitchell's remark^b that "no village with the population of 1,000 and over should be more than, say, a mile or half a mile from a public road", really deserves consideration, as a new India with improved agriculture and industries shall necessarily need a quicker and more efficient system of transport. The Bombay Plan makes provision for the doubling of the present mileage. The village roads leading to the main roads may be ordinarily metalled as they are not likely to have very heavy traffic. An average road may be about 20 feet wide†.

The Government Road Plan contemplates the building of about 400,000 miles of roads in 15 years. To bring about an uniform development, the roads are to be classified as (1) National Highway (2) Provincial Roads, (3) District Roads and (4) Village Roads; out of which No. 1 are to be maintained by the Central Government; while the other three are to be maintained and developed by the individual provinces. As a measure to economy, the Government intend decking the present railway bridges for road traffic. All new bridges are to be made for combined road and rail traffic. Skilled labour, machines and material now employed by the army is intended to be diverted to civilian road-making.

Vehicular traffic on roads takes the shape of bullock and camel carts as well as automobiles. Bullock and camel carts predominate on the unmetalled and village roads while more of motor vehicles are to be seen on the main metalled roads‡. There are about 6,284,011 carts in British India and about 2,422,311 carts in the Indian States. The following table gives some individual figures:—

C. P. and Bihar	... 1,166,505 carts.
Madras	... 1,241,424 „
U. P.	... 1,093,864 „
Bengal	... 821,914 „
Bihar	... 545,248 „
Punjab	... 329,320 „
Hydrabad	... 521,417 „
Rajputana States	... 320,486 „
Eastern States	... 310,185 „

*Sir Kenneth Mitchell in his presidential address to the 1943 Session of the Indian Roads Congress

†The Bombay Plan suggests 18 feet.

‡Porters and ponies or mules are used mostly in the hills.

The indigenous cart does not present the picture of a healthy vehicle. It is, therefore, very important that the cart is also improved. The Bombay Plan advocates "the use of pneumatic tyres universal" as it may go a long way towards increasing the facilities of transport in rural India and as it may also reduce the cost of maintenance.

Carrying of goods and passengers by automobiles is as yet not so very developed in the country. In pre-war years British India had about 175,000 motor vehicles of which about 50,000 were heavy buses or lorries*. The states had 22,244 motor vehicles.

The following table gives provincial figures :—

<i>Province</i>	<i>Total</i>	<i>Persons to one Motor</i>
Bengal	29,741	1949
Bombay	27,957	588
Madras	21,278	2214
U. P.	18,112	2931
Punjab	13,372	1230
Bihar	7,577	3474
C. P.	65,38	2239
Orissa	1,266	4750
Sindh	4,826	1031
Hydrabad	.....	3600
Mysore	.....	1475
Gwalior	.....	1601
Jodhpur	.....	2503

This works out that we have one motor vehicle for every 2,400 persons.

As compared to this, in U. S. A. one vehicle is meant for every four or five persons; in U. K. it is meant for every 20 persons; and in Japan for every 640 persons†

A number of motor services now exist between important stations in the country; the most important being :

(a) Saharanpur—Dehra Dun—Mussoorie—run by the Gwalior and Northern India Transport Co. Ltd.

(b) Rawalpindi—Murree—Kashmir.

(c) Kathgodam to Ranikhet and Nainital.

(d) Abu Road to Mount Abu.

(e) Harpalpur—Nowgong—Chattarpore.

Our annual imports of motor vehicles work out about 35,000 valued at about 10 crores of rupees. It is, therefore, apparent that we need a vast increase in this direction. There is also a consider-

* Review of the Trade of India—1938-39—p. 101.

† U. S. A.	...	29,400,000	Canada	...	1,306,139
G. B.	...	2,418,728	Japan	...	175,761
France	...	2,192,471	Australia	...	749,753.
Germany	...	1,564,600			

able scope for a first-rate automobile industry in the country. The following official remarks* are quite interesting :

“So far as motor transport is concerned, the main object should be to get it into the heart of the countryside and to prevent undue over-crowding and competition on the better developed routes Motor transport should also be used to a greater extent than hitherto by the governments in India for administrative and development purposes.”

A mention has already been made about the prospects of Automobile Industry in India. A short while ago, the Government have granted sanction to two prominent groups of industrialists to raise share capital for their ventures. The skilled labour is amply available in the country. The General Motors now occupy an area of about 70,000 sq. yards. The company also trains workmen. If the industry is fairly well-developed in the country, a large number of people will be employed. The home market, as has already been pointed out, is huge and the demand will rapidly go on rising.

Plans for the establishment of an automobile assembly plant in the suburbs of Bombay are now well in hand and the work of producing motor-cars with the help of experts and technicians from England will be complete in about three months, according to information available.

The proposed motor-car factory will provide employment for several thousands of workers and, it is believed that several hundreds of demobilised technicians will be absorbed in the establishment. A ground expert is inspecting the ground to decide the suitability of the site which is likely to be two to three square miles in extent.

Mr. William Denis Kendall, a member of the British Parliament, with an expert is in Bombay. The purpose of Mr. Kendall's visit is to discuss questions relating to the establishment of an automobile factory in Bombay and the details of producing cars both in England and in India to cater to the world market. The sponsors of the scheme contemplate to have the price of cars as cheap as possible. Tractors, which will also be built in this factory, will be made cheap so as to enable the agriculturists to buy them.

It is proposed to train Indians in the motor car equipment industry with the help of technicians and experts from England, who will be employed by the industry. It is also proposed to send groups of Indians to England to work in motor-car factories there. It is hoped that after a year, the factory in Bombay will run with a full complement of Indian technicians and skilled workers.

Rail-road competition. The motor transport has rapidly increased in India since 1924 when only about 6,300 vehicles were registered in the whole of the country. The number rose to about 15,100 in 1937-38. First of all motor transport was confined to short distances

*Reconstruction Committee's Second Report on Reconstruction Planning (1944)—p. 28.

but nowadays it is being used for carrying goods and passengers even to long distance. And as such the competition with railways has become acute. It is, however, keenest over short distances. It is always cheaper to travel by bus. The railways made so much hue and cry over this that some time back the government appointed a small committee to go into it. They recommended a stricter control over motor transport and introduced measures to ensure greater efficiency. Goods traffic is, however restricted to short distances and this cannot be checked. Regarding long distance journeys, a system of zoning was recommended.

The Wedgewood Committee (1937) pleaded for the co-ordination of the rail and road transport. They recommended faster trains and a greater number of trains in certain sections. It was also suggested that more attention should be paid to the Intermediate and Third class passengers. For the transport of goods faster services are recommended.

Caravan Routes. Mention may be made of the few land routes to some of the neighbouring lands. Travel by land is very insignificant because of the high mountains, forests and other impediments that characterise our land frontiers. Some mention has already been made of the few mountain passes in the northern mountains. Six main routes may be mentioned.

(1) From Chaman in Baluchistan to Kandhar and Herat *via* the Khojak Pass.

(2) From Quetta to Zahidan (also by rail) and then to Persia (Iran).

(3) From Peshawar to Jalalabad *via* the Khyber.

(4) From Attock to Kashgar *via* Chittral and Hindu Kush.

(5) From Dera Ismail Khan to Kohat and Kandhar.

(6) From Leh to Tibet and Sikiang.

AIR TRANSPORT IN INDIA

In the matter of speed air transport ranks above all other forms of transport. Its track expenditure is also at a minimum. Its distribution is very much independent of the geography of the land* and as such the flexibility of air transport is immense. But weather conditions, safety and the ratio of weight-carrying capacity are important points against air transport. Fair and clear weather is almost a necessity for flying and as such no guarantee can be given for maintaining services. Air travel is not yet secure against crash etc. The weight carrying capacity represents a very low figure. "The single horse drawing 50 tons along a canal at 3 m. p. h., and the 3000 horse-power four-engined flying-boat with its 3½ to 5 tons of paying load carried at 180 m. p. h. represent two extreme contrasts in transport."

*An aerodrome can be constructed on any piece of sufficiently level ground.

†Bonavia, *The Economics of Transport*—p. 28.

India represents very suitable ground for development of air transport. Her almost flat lands and valleys, her fair and clear climate and her strategic position between the East and the West are very favourable points. It is, therefore, a pity that air travel is as yet too insignificant a feature in the country. The war has brought air transport into great prominence. Speedy transport is now an essential part of the economy of the country and it also forms "an important adjunct to national defence." It is, therefore, only natural and reasonable that "our planning must create the necessary conditions to place this country in the front rank in the world aerial transport."*

The first commercial aeroplane made its appearance in India in 1911 when a French pilot flew with 5000 letters from Allahabad to Naini. It was, however, not until much later that "the Government of India's policy regarding civil aviation was enunciated in March 1927."† Between 1927 and 1931 arrangements were completed for the construction of some aerodromes and a few landing-spaces. A number of flying clubs had been established in India by 1934—at Delhi, Karachi, Bombay, Madras, Calcutta, Lucknow and Lahore. They were given monetary help by the Government and they undertook to train a number of pilots and engineers. In 1929 the Imperial Airways Ltd introduced the Croydon (London)—Karachi Air Service. Services were then introduced between Karachi and Bombay, and Karachi and Delhi.

Now India has about 6,500 miles of regular air routes within. India Other particulars are given below‡ :—

	1934	1936	1938
Miles flown by regular services (internal) ...	345,777	496,539	1,412,334.
Passengers carried ...	757	349	2,104
Weight of Mails carried (tons) ...	21.3	49.4	244.6

There are at the moment four Air Services§ operating within the country :—

- (1) Tata Sons Ltd—1932.
- (2) Indian National Airways Ltd.—1933.
- (2) Air Services of India Ltd.—1937.
- (4) Nizam's Airways (between Hyderabad and Madras).

(1) The Tatas' run the following services|| :

- (a) Karachi to Colombo *via* Bhuj, Ahmedabad, Bombay, Hyderabad and Trichnopoly—Formerly it used to take 2 days for the entire journey, but the present non-stop service takes only 15 hours.

*Shah, *India To-morrow*—p 84

†N. Sanyal, *Communications and Transport (Economic Problems of Modern India Vol. I)*—p 290

‡Raghvan, *Planned Economic Development of India*—p 86.

§Details about the Indian airways were kindly supplied by the Manager,

Messrs Thomas Cook and Sons Lahore

||They also run "Special Charter Services" between many stations in India.

- (b) Bombay to Calcutta—7 hours.
- (c) Bombay to Madras *via* Bangalore—4 hours.
- (d) Bombay to Coimbatore *via* Bangalore—4 hours.
- (e) Delhi to Bombay *via* Jodhpur and Ahmedabad—6 hours.

(2) The Indian National Airways run the following services :

- (a) Delhi to Peshawar *via* Lahore—5 hours.
- (b) Delhi to Bombay and Colombo—11 hours.
- (c) Delhi to Karachi *via* Jodhpur—5 hours.
- (d) Delhi to Calcutta *via* Cawnpore, Allahabad and Gaya.

(3) The Air Services of India Ltd. have services between Bombay and Kolhapur *via* Poona. The service have, however, been temporarily suspended.

It may be quite useful to learn air distances between Bombay and certain other stations in India :

To	Miles
Ahmedabad	273
Allahabad	712
Banglore	544
Bhuj	461
Baroda	224
Calcutta	1030
Cawnpore	704
Chittagong	1246
Colombo	984
Dacca	1171
Delhi	798
Gaya	870
Gwalior	642
Hydrabad (Sindh)	572
Indore	315
Jodhpur	497
Karachi	656
Kolhapur	192
Lahore	865
Madras	721
Quetta	1020
Rangoon	1723
Trichnopoly	704

India is also linked by air with many foreign countries. Many foreign companies have fully established air stations in the country. The foreign services are :

- (1) British Airways Corporation and Indian Transcontinental Airways Ltd.
- (2) K. L. M. (Dutch).
- (3) Air France.
- (4) Calcutta-Chungking Air Service.

1. The two companies were operating five weekly services each between India and England. The British Airways were also operating three weekly services to Southampton and Sydney. The joint services were also run between England and Calcutta. These were, however, suspended in 1940. Afterwards mails were transmitted from India to Australia, to U. K. and other European countries by air upto Durban and then by sea everyweek.

2. K. L. M. had 3 regular services between Amsterdam and Bardoeng. The services operated to a $2\frac{1}{2}$ day schedule between Europe and Karachi and its route in India lay *via* Karachi, Jodhpur and Allahabad to Calcutta. K. L. M. also operated a weekly service between Lydda in Palestine and Sydney in Australia.

3. Air France operates 3 services a week between Paris and Hanoi. This service too operated to a $2\frac{1}{2}$ schedule between Europe and India. It followed the same route across India as the K. L. M.

4. It is a new service (started 1941) and runs between Calcutta and Chungking. The service is managed jointly by the China National Airways Corporation and the British Airways Corporation. At present there are three services per week each way.

There is no doubt that India badly lags behind in the development of her air transport facilities. The following table gives a comparative study of 1938 figures.

Country	Mileage of Routes	Freight and Mail carried
India	6,700 miles	244 tons
U. S. A.	71,200 "	3,000 "
France	41,000 "	1,250 "
Germany	33,000 "	2,500 "
U. K.	25,000 "	600 "

In 1930 the number of registered aeroplanes in India was 42 and that of certified pilots was 150. In 1934 these increased to 102 and 302 respectively. Commercial planes cover about 13,000 miles only in a week, although including the planes used for transport across the borders of India, the mileage may come upto about 20,000.

It may not be out of place to add here a few lines about the importance of *Karachi*, the busiest airport in India, nay perhaps in the world. Karachi, the capital of Sindh has long been the gateway to India from the Arabian Sea and is now "the crossroads of the skies." It has the peculiar advantage of being an air-port along with a sea-port and as such handles the greatest amount of passenger and goods traffic; the war having given it additional importance. In a month the airport handles nearly 2,500 lbs of freight and about 5,000 passengers and it is expected that as soon as all the development plans are completed, these figures may rise by ten-fold. Already roads and aerodrome buildings are being constructed to make it even greater.

The present Bombay-Delhi Service will continue.

Plans are reported to be ready for inaugurating these services, but the date of their actual commencement will depend upon the availability of 'planes.

It is reported that the Gwalior Government are preparing to make Gwalior "the Amsterdam of India." A company has already been formed to operate services between all the principal towns of India. A similar venture is reported from Lahore.

INLAND WATER TRANSPORT

Long before railways and roads came to be used water transport was in use in India and elsewhere. The great advantage of this particular means of transport is that it is much cheaper. During the recent times, however, there has never been any effort to consider the development of our water transport seriously. The Industrial Commission and also the Acworth Committee deplored the existing state of affairs and recommended "the adoption of a policy designed to encourage the use of inland water-ways for transport purposes. It is, therefore, a matter of regret that nothing has yet been done in this direction.

During the present war, however, Inland Water Transport has to some extent been revived, owing mainly to congestion on the railways and to a lack of petrol. The Government plans for post-war reconstruction also contain points about the development of this particular type of transport. The points under consideration are —

- (a) The improvement of the navigability of rivers and other existing water-ways.
- (b) The possible use of irrigation canals for inland traffic.
- (c) The construction of new artificial water-ways.
- (d) Greater use of steamers, tugs and power-driven barges.
- (e) The improvement of countrycraft.
- (f) The co-ordination of water transport with other means of transport.

At present, however, there are only about 3,800 miles of navigation canals,* but irrigation canals and rivers are navigable for about 25,000 miles or even more. Owing to the relief of land, there is practically no navigation in the plateau region of the south and in the mountains of north. If at a future date, however, the forest resources of the Himalayas are tapped, the northern rivers will be handy in floating logs of wood to the factories in the plains. It is, therefore, only natural that most of the water-transport is used in the northern plains and in the deltaic regions of the eastern coastal plains. The three rivers of the north i.e. the Indus, the Ganges and the Brahmaputra along with their tributaries afford decent navigation facilities.

*More than two thirds being in Bengal and Madras.

The *Indus* is about 1,800 miles in length and it is navigable for about 1,000 miles from the mouth upto Dehra Ghazi Khan. The upper portions of the river are not navigable because of a gradual fall of about 900 feet from its source. The absence of towns on its bank is due to its shifting character. The Sutlej and the Chenab, two of its tributaries are used by boats all the year round. The Punjab canals are meant mainly for irrigation and not for navigation purposes.

The *Ganges* like the *Indus*, is a perennial river and offers, along with its tributaries, facilities for navigation without much capital investment on it. Boats can easily ply in the *Ganges* upto Hardwar but steamers can come at the most upto Cawnpore from its mouth. It may, however, be noted that the river maintains an uniform depth of about 30 feet upto about 500 miles from its mouth and this stretch is specially suited for steamer traffic. In pre-railway times the *Ganges* and its tributaries formed magnificent 'aquatic roads'. This easily explains the location of a number of important cities on the banks of these rivers—Agra and Delhi on the *Jumna*; Allahabad and Benaras on the *Ganges* and Lucknow on the *Gomti*. The *Jumna*, the most important tributary of the *Ganges* is navigable for its entire length of about 860 miles. Other tributaries are *Gumti*, *Gogra*, *Gandak* and *Son*. They are also used for boat traffic—some for hundreds of miles. A number of old important cities are situated on the banks of these rivers as they formed the only highways of commerce before the railway and motor transport.

The *Brahmaputra* is one of the longest rivers in the world but for more than half of its course it lies in Tibet and Assam. It is only upto about 800 miles from the sea—say upto Dibrugarh—that the river is navigable by steamers; boats may be able to go further up. The rivers work under some drawbacks more important of which are (1) the presence of a sufficiently strong current during the rainy season and (2) the frequent formation of sand-banks, new islands and shoals.* The *Surma*, a tributary of the *Brahmaputra*, is used for navigation upto Sylhet.

Owing to natural difficulties, railway or road development is difficult to operate in Eastern Bengal and as such the excellent network of rivers afford fair opportunities of developing river transport to higher standards of efficiency and usefulness. Small canals and channels provide a connected link for up-going steamers from Calcutta to Assam. A large amount of jute and Paddy is transported to the ports or to the manufacturing centres by means of these rivers.

India, south of the *Vindhayas*, presents a poor picture in this respect because of (1) the rough relief and (2) absence of snow-fed

*The current in the *Ganges* and the *Brahmaputra* becomes sluggish in Bengal owing to the flatness and the low altitude of the land. A lot of silt is, therefore, deposited by them. To keep the traffic going, constant dredging has been done.

Most of the fodder crops fall into two natural groups: (a) The Legumes and (b) the grasses. Amongst the more important legumes are guara, lucerne and clovers; while amongst the grasses more important varieties are Dub, Elephant grass and Guinea grass.

SOME PROBLEMS OF THE LAND

A minute study of the foregoing pages about agriculture in India brings home the fact that the yields are low, the quality is poor and that there is a great need for improvement all round. The reasons may be briefly described below:—

1. Soil deterioration is the main problem. This means that the soil is getting exhausted because of intense strain and lack of manure. Manuring problem, therefore, requires our immediate attention. Greater use of dung as manure is needed. Artificial fertilizers like the neem and castor cakes need greater popularity. More and more fallow and *banjor* tracts need reclaiming.

2. Soil erosion is a great menace to our agriculture. The term simply means the weathering away of the upper layers of soil by running water, wind and human and animal agencies. It is a direct result of deforestation, a policy which was being commonly followed in India not long ago. Sheet erosion is common throughout India except in lands irrigated by canals and wells and is more serious in sloping land. Deeply gullied headlands are to be seen in many parts of India wherever the level of the land surface is at all high above the bed level of the nearby river. The Jumna basin provides some of the finest examples of gullied or ravine formations. The presence of *kankar* on the banks of the Jumna and the Chambal proves to us the violent erosion that seems to have taken place during the last few decades. It is estimated that the total erosion of the Jumna-Chambal basin is equivalent to the removal of one-half ton of soil per second for the last 1000 years. In the northern areas specially around Attack and Cambellpur and along Delhi-Lahore line, wind erosion is much more marked. The harmful effects of soil erosion are, (a) gradual removal of the upper layers of soil, (b) gradual decrease in yields, (c) pasture lands gradually lose their capacity to support livestock, (d) large quantities of sands and rock material are dumped into river beds thus raising the river-beds, (e) owing to the coming to the surface of hard rock material, percolation of rain-water gets less and the water-table is apt to shrink.

The problem is being tackled by means of two channels, firstly, the reclamation of usar lands and secondly, the protection of the areas of probable damage. The cure* of this dangerous disease lies mainly in the restoration of the vegetation so as to protect the soil from the action of the denuding agents. This can be secured by

* As suggested by Sir Harold Glover in his "Soil Erosion" (Oxford Pamphlet No. 23.)

Even the coastal trade is in the hands of foreigners—only 25 p.c. is done by Indian ships. The following table shows the respective share of different countries in ownerships of ocean-going vessels.*

Country	Tonnage	Percentage
India	1,63,853	0.24
China	2,58,442	0.37
Belgium	4,08,418	0.59
Russia	11,76,113	1.69
France	29,52,975	4.25
British Dominions	30,67,250	4.30
Germany	44,92,708	6.47
Japan	56,23,446	8.11
U. S. A.	120,03,028	17.29
U. K.	179,84,158	25.90

The total coastal trade of India in 1939-40 was estimated at Rs. 81.2 lakhs out of which Rs. 39.70 lakh were imports and the rest exports. This shows an appreciable decline from the trade in 1937-38 when the total value was Rs. 96.42 lakhs. This is perhaps due to the war.

The following two tables show our position very clearly.

Table A

World's Merchant Marine in 1939.

India	0.13	million tons
U. K.	18	"
U. S. A.	13	"
Japan	5.6	"
Germany	4.5	"

Table B.

Share in India's trade.

		Coastal trade
Indian companies	...	20 per cent
British companies	...	80 " "
		Sea-borne trade
British Indian vessels	...	3.1 "
British	...	66.0 "
Foreign	...	30.0 "

The two most important shipping companies in India are (1) the British Indian Steam Navigation Company Ltd. and (2) the Asiatic Indian Steam Navigation Company†—both are British owned. We possess a very small number of deep-sea ships—about 30 with a total of about 150,000 tons. Most of our ports except the

* Figures taken from the Scindia Ship-building Supplement of the "Hindustan Times"—22nd June 1941.

† Zoroaster, the India's first coastal craft built by Trades (India) Ltd., was recently set afloat at Bombay by Lady Homi Mehta. It took four months to build it.

more important ones *i. e.*, Bombay, Calcutta, Madras and Karachi, have poor harbour facilities. In recent years several smaller ports have been developed more particularly in the states, but the number of good ports for coastal shipping still remains very meagre.

Some years ago Mr. Haji estimated that the passenger traffic on the coastal vessels of India is second to that of U. S. A. and that the goods traffic was also comparable with most of the important countries of the world.* The Indian Mercantile Marine Committee was appointed in 1923 and in their report, the committee suggested

(1) that suitable arrangements be made for training Indian young men in marine engineering etc.†

(2) that the coastal trade of India be permitted by only those ships which were virtually to come under Indian ownership and control.

(3) that the ship-building be encouraged at Calcutta; preferably by an Indian concern.‡ In 1928 an important bill for the reservation of coastal traffic was moved in the Assembly but eventually it had to be dropped.

The long sea-board of India presents unique opportunities for cheap transportation of bulky commodities. The Government of India realise that shipping facilities§ in India are very low. The war has stressed "the necessity for India to find adequate shipping from her own resources." The Government are of opinion that "post-war shipping policy must be directed towards the acquisition for India of an adequate share in the world's carrying trade."§ From the Indian point of view deep-sea shipping might be classified as :—

(a) Coastal trade—involving the trade between India, Ceylon and Burma. The present Indian share is about 20-30 per cent. An increased share is aimed at.

(b) Near trade—*i.e.*, trade with Persian Gulf, East Africa, Malaya and East Indias (Dutch). In this we have as yet no share. The aim is to secure quite a substantial share.

(c) Eastern Trade—involving that of which Japanese shipping will be dispossessed; of this also a fair share should be ours.

(d) European and American Trade—*i.e.* trade between India and the Western countries. As yet India has no share at all in this. The post war plans also aim at having a share in this trade.

*S. N Haji, Economics of Shipping—ch. XI.

†A training ship 'Dufferin' has been provided at Bombay. Another ship for the same purpose has been put into service at Karachi.

‡A dockyard has now been equipped at Vizigapatam for building steel ships of medium size (about 10,000 tons).

§This industry has been promoted by Mr. Walchand Hira Chand of Bombay with Indian capital and labour

§Second Report on Reconstruction Planning—pp. 30-31.

The Government have also taken some steps 'to ensure the fullest utilization of country craft and to prevent wasteful competition between country craft and steamers.'

The Bombay Plan puts down the following remarks about coastal shipping* :—

" For a long time past, very few ports in India except Bombay, Calcutta, Madras and Karachi have had adequate shipping facilities. In recent times several smaller ports, principally in Indian states, have been developed but still the number of ports suitable for coastal shipping is very small. If coastal shipping is to occupy its legitimate place in the transport system of the future, it is necessary to provide more harbours suitable for small ships. A capital expenditure of about Rs. 50 crores may be estimated for the purpose. At 10 per cent the maintenance charges would amount to Rs. 5 crores per annum."

The Royal Indian Navy :—The Royal Indian Navy has expanded more than ten times since the war began. Many trace its origin so far back as 1612 when the East India Company stationed at Surat, thought it necessary to have armed ships for protecting their trade. It was, however, in 1934 that a regular Royal Indian Navy came into being with 4 armed ships, 2 patrol ships, 4 mine-sweeping trawlers, 2 surveying ships and a depot ship.† During the present war expansion has been rapid, a number of new ships have recently been constructed and the R. I. N. did valuable work in the Eastern Theatre of war, and in the western portion of the Indian Ocean. A large portion of the new vessels are of Indian make. A number of yards have been established along our coast-line and on certain rivers. All the materials employed are supplied by India, except, of course, for the engines and motors. The labour including engineers is entirely Indian.

POSTS AND TELEGRAPHS, TELEPHONES AND RADIO.

Postal communication is very well developed in the country, although if regard is had to the population, it must be pronounced as very small. In 1938-39 there were 24,303 post offices in the country. The number increased to 25,671 in 1942-43. ; and the intention of the Government is to have a post office for every village having a population of 2,000 and over. The following table gives some other valuable information regarding the postal facilities in the country.

No. of letter Boxes	56,149
Strength of staff	134,578
Postal Traffic	2,370,010,382.

* A Plan for Economic Development of India—p. 38.

† Formerly it was known as 'Royal Indian Marine.'

The following table gives the number of post offices for every 10,000 of the population in India and some other countries.

India	less than 1
Canada	12
U. K.	5
U. S. A.	4

The first overland post between England and India was established in 1830 when the steamer Hugh Lindsay made the first voyage from Bombay to Suez. In 1840 P and O obtained a charter for the conveyance of mails between London and Suez en route to India. Now services exist between India and nearly all the countries of the world.

The Empire Air Mail scheme came into force in 1933 with four services in a week from Calcutta to London. The frequency of the two feeder services i.e. (1) Karachi-Lahore and (2) Karachi-Madras-Colombo was also increased to four. The frequency was increased to five in July 1938. In 1939, 550 tons of mail were carried by the system. At the out-break of the Second Great War in September, 1939, the service was suspended—a restricted service was, however, continued till June 1940, when Italy entered the war. Now that the war has come to a close, more and more air-mail facilities are in evidence.

The India-England Airgraph service was inaugurated in February, 1942. The airgraphs are photographed at Bombay on a miniature film and the films are sent through by air to U. K. where a photograph facsimile is made and delivered to the addressees. The daily average number of airgraphs is more than 5,000.

Within the country too letters can in normal times be sent by air. In 1937 Tatas established services between (1) Bombay and Delhi via Indore, Bhopal and Gwalior; (2) Bombay-Trividrum—Trichnopoly (where it connects with services to Colombo). Other facilities given by the postal department are :—

- (a) Value-payable system was established in 1871.
- (b) Money-order system was introduced in 1880.
- (c) Postal Savings Bank started in 1885
- (d) Postal Insurance (for Government servants only).

In the matter of telegraphic communications* too, India is quite well up. There are about 14,300 telegraph offices dealing with about 24,000,000 messages annually. The present mileage of telegraph lines is about 560,000 miles (510,000 miles in 1938-39). But when compared to the vast population of India, the figures are miser-

*Since 1912 and 1914 this department has been amalgamated with Posts Department.

ably low.* The following table shows the number of telegraph offices per 10,000 of population in India and in some other countries.

India	·35 (1 for 30,000).
Canada	4
U. K.	3
U. S. A.	2
Japan	2

The post-war plans of the Government have provision for having one telegraph office in every village with 5,000 population (or for grouped populations of the same number). The *Photo-Telegram* service was introduced in 1943 between London and Bombay. India also communicates with other countries by means of Cables which are landed at Bombay and Madras and a Cable running up the Persian Gulf to Iraq at Karachi. Land line connections are maintained via Peshawar and via Quetta with Afghanistan; via Nonthen with Siam; via Bhamo with China and via Gyanete with Tibet.

Telephonic communication is still reckoned a luxury in India—out of the reach of means of more than 90 per cent of the people of the country. There are now more than 300 Exchanges with about 60,000 connections and about 36,58,718 Trunk Telephones. This means that there are 1·7 telephones per 10,000 of population. Corresponding figures for some other countries are given below:—

Japan	...	...	105
U. K.	...	...	429
Canada	...	...	1,349
U.S.A.	...	...	1,637½

All the telephone lines have now been taken over by the government. The automatic telephone was for the 1st time installed in Simla in 1913 with 700 lines.

The reconstruction plans of the Government provide for a telephone exchange, with trunk connections in all towns where the population is not less than 30,000.

Radio is gradually getting popular and it is a healthy sign because "the use of radio in India has potentialities of a far-reaching character."† India has in all 13½ broadcasting stations and 31 wireless stations maintained by the Government. In 1943 March there were 167,123 holders of wireless licenses, as compared to 9,275 in 1933. These figures, however, are quite negligible when

*First Telegraph line was started in 1851 between Calcutta and Diamond Harbour.

†This means that every sixth persons in U.S.A. owns a telephone.

‡Vishvesvaraya, *Planned Economy for India*, P. 82.

§ 9 in British India and 4 in Indian states—2 in Hyderabad, 1 in Mysore and 1 in Travancore;

compared to the vast population of the country and when compared to the great progress in Europe, America and Japan where "it has become an indispensable dynamic institution."

The largest number of licensed listeners is in Bombay where at the end of 1942 there were 39,000 license holders. The next largest number is found in the Punjab and N. W. F. P. where the number comes upto 37,000.

Wireless apparatus and radio sets are upto now imported into India from Europe and America as there is practically no factory in the country for such constructions. In 1941-42 All-India imports were valued at Rs 53 lakhs out of which Bombay claimed more than 40 per cent. Most of our imports come from U.K. and U.S.A. Netherlands also send us some radio goods. The following table gives details.

	Complete sets	Valves
U. K.	Rs. 19,000,00	Rs. 80,997
U. S. A.	Rs 1,300,030	Rs 1,60,000
Netherland	Rs. 354,000	...
Others	Rs. 68,000	Rs. 28,000

The post-war plans contain large progress proposal in the number of wireless stations and also broadcasting centres.

APPENDIX I

*Old and new Routes to India.** The Aryans and those who followed them entered India from the North-West—some also from the North-East. These over-land routes have hitherto remained undeveloped mostly because of natural difficulties. The present war has however, improved things.

The Stilwell Road (Ledo Burma Road) has been greatly reconstructed. It is the same old Tribute Road used by mule caravans for import of silk into Burma and India. From Ledo in Assam, a railway line runs to Calcutta (1014 miles down south) via Parbatpur. The haulage between Ledo and Parbatpur has tremendously increased due to the war requirements. The Amingaon-Pandu ferry on the Brahmaputra has also now increased its carrying capacity. The road from Ledo to Kunming is 1044 miles long (although the air route is only 435 miles long). The two stations are also connected by a pipe and a telephone line. At Wanting it is joined by the old Burma Road.

*Prof. S. C. Bose's paper on 'Routes to India' published in 'India and World Affairs' Sept. 1945, pp. 139-144, gives a very good summary of the whole problem. We have freely drawn from the same.

On the Arakan coast the road leading from Chittagong to Akyab and beyond is a very unused road in peace-time.

The Burma-Siam road was built by the Japanese. It runs from Ye to Bangkok. It is also expected that the Chinese railways are now connected with Siamese railways *via*, Indo-China. Thus it may now be possible to go from Rangoon to Paris and London by rail. Siam and Indo-China now lie 1000 miles nearer to Rangoon and Calcutta.

New developments in Kra Isthmus and in the inter-national Pakchan river have also reduced distance between Calcutta and Saigon by 600 miles and between Rangoon and Bangkok by about 1,200 miles. Only a canal (a ship canal) is needed between Kra and Chumpon—a distance of 40 miles. Singapore, however, stands to lose in importance as a "Gate-way to the East".

The Silk Road which is really a continuation of the Tribute Road mentioned above, runs through the Central Asiatic Steppes. It is now called the Red Road or the Alma Ata Road. It goes on to Kansu on the western boarder. The section between Kansu and the Wei Valley is not developed, but if it is developed, it will be possible to travel from India to Europe by car through China.

From Khotan beyond the Karakoram, a route crosses over to Leh and then to Srinagar *via*. Zojila.

Further west from Yarkand many routes cross the high snow-bound passes in the Pamir knot to the Turk-Sib railway.

A number of routes from Tibet cross over the Himalayan passes into India. The most important of these is the one from Lhasa to Gangtok. Beyond Lhasa, a route turns eastwards and reaches Chamdo on the Mekong, and then to Ta-Tsien-lu and Chungking. This route was used to supply military goods to China from India, when Burma Road was cut off. Another route from Lhasa goes northwards through Tsaidam and Koko Nor to Lanchow.

Many routes from India converge at Manasarovar. The routes start from Almora, Mussoorie and Simla and reach the Manasarovar Lake, which is also connected to Lhasa by a route *via*. the Tsangpo valley. A greater development of routes to this area may be useful.

West of Leh in the Upper Sindh Valley an ancient caravan route passing through the Gilgit valley to Badakhshan and Tadzhik.

However, the most important routes coming into North Western India, important historically, strategically and economically, are the "five fingers", pointing towards the land of five rivers across Koh-i-Suleman. They are the passes of Khyber, Tochi, Gomal, Kurram and Bolan. Strategic railways and roads have been built through them to the borders of India and beyond. Such are the rail-heads at Landikhana, Malakand, Thal, Bannu, Fort Sandeman and Chaman, and the road heads at Abazai, Parachinar, Datta Khel and Wana. But beyond the border only two good roads are

leading, one to Kabul from Peshawar and the other to Kandahar from Quetta. Kabul and Kandahar are joined together by a badly kept road through Ghazni.

Strategically these routes are of vital importance to the safety of India. As to their future development two possibilities lie before us. The Indian rail-road at Landikhana is only 200 miles away from Termez, the Turk-Sib railway station on the Oxus. But in between lies the 10,000 ft. crest of the Hindu Kush, crossed over by a route through the Bamian Pass. But though the mountain is high, it is narrow, and its base-tunnelling is a distinct engineering possibility.

Again the rail-head at Chaman is 600 miles away from Kushk, a Russian rail-head on the Afghan border. The route between these two towns passes through Kandahar and Herat. It does not encounter any physical obstacles. If one of these railways is built across Afghanistan, one will be able to travel by rail from Calcutta or Comorin to Calais.

Another series of important routes to India converge on Zahidan the rail-head on the tip of the railway line, jutting out across Baluchistan beyond the border. The surrounding country is a stony desert and nomadic tribes, well known for their criminal habits, inhabit the hills on both the sides. The railway has therefore only strategic importance, which was amply proved during the present war. Zahidan became a great supply depot, from where goods from India were dispatched to Russia and the Middle East, perhaps as far as Suez and even beyond. The importance of this route is further enhanced by the fact, that it gives direct land communication between India and the rich oil fields of Iran, Iraq and the newly discovered fields in Arabia.

A review of the great air routes which will cross through India in the future is also desirable. The American 'Pipe Line' is already operating from Florida to Calcutta. Besides the Assam-Kunming air-route over the "Hump", the A.T.C. has organized the new Trojan air service from Calcutta area to Kunming. In official language each plane can carry "more than 10,000 lbs", or a cargo which requires four trucks to carry. 40,000 tons of material were carried over the hump in January, 1945. The largest nonstop flight of these giant planes was from Calcutta area to Chengtu in Szechwan, 1,200 miles away.

These foreshadow great developments in post-war civil air transport. The Consolidated Vultee Aircraft Corporation have partially announced their plans, of using fast, commodious planes in global air services. The Transcontinental Western Airlines of U.S.A. have announced the use of their new type of Lockheed Constellation passenger plane which will carry 57 passengers. It will cover the distance between India and New York in only 41 hours. British air transport lines are also contemplating great developments in the future. Work has already commenced on a super-plane, called the Brabazon type I, which will fly in the stratosphere and will carry 224 passengers

seated or 80 sleeping passengers. The global air route through Karachi, Delhi, Allahabad and Calcutta is thus destined to become a great air highway of the future. India must have proper share in this new enterprise.

APPENDIX II

A. Shipping services in India.

- | | |
|--------------------------------------|---------------------------|
| 1. Bombay-Karachi | } closed for the present. |
| 2. Bombay-Bhawanagar | |
| 3. Bombay-Jaigad | |
| 4. Bombay-Vizadurg | |
| 5. Chandpal-Rajgunj. | |
| 6. Calcutta-Ranichuk. | |
| 7. Calcutta-Nadia. | |
| 8. Calcutta-Islampur. | |
| 9. Calcutta-Silchar. | |
| 10. Dhanashkudi-Talaimanar (Ceylon). | |
| 11. Tuticorin-Colombo (Ceylon). | |
| 12. Assam-Sunderbans. | |

B. Indian ports (other than Calcutta, Bombay, Karachi and Madras).

1. Alleppey is the premier port of Travancore and is situated 35 miles south of Cochin. A canal connects the port with the interior backwaters. It affords a safe anchorage during the greater part of the year. The normal tonnage of vessels touching this port is about 300,000. Copra, cocoanuts, coir fibre and matting are the chief exports.

2. Bedi-Bandar is the chief port of the state of Nawanagar, situated at the head of a tidal creek about eight miles long, near the mouth of which lies Rozi where ocean-going vessels lie at anchor. Owing, however, to siltation and the shifting mudbanks, steamers cast anchor miles from Bedi in the Gulf of Cutch. About 700 vessels call at this port every year. In 1934-35, the port accounted for £ 447,000 worth of imports and £. 335,250 worth of exports.

3. Bhavanagar is the chief port of the Bhavanagar state. It is situated half way up on the western side of the Gulf of Cambay at the head of a creek. The tidal flow is very great here, as high as 40 feet. The actual anchorage area is situated about 8 miles from Bhavanagar. There are, however, good direct railway communication with the rest of India. The port handles about £ 2,000,000 worth of imports and about £ 900,000 worth of exports.

4. Calcutt is an important port on the Malabar coast, about 400 miles from Madras by rail. The sea around here being very shallow, vessels anchor about three miles from the shore. Only native craft of 150 tons and below can lie in the harbour itself. The port has a good light-house visible from 12 miles in the sea. About 600 steamers (2,000,000 tons) visit the port every year. The imports are valued at Rs. 1,36,92,000 consisting mostly of machinery, sugar, cotton goods and kerosene oil. The exports are valued at Rs. 1,97,06,000 and consist mostly of coir and coir fibre, coffee, tea and spices.

5. Chittagong is since 1928 included amongst the major ports of India and as such it is controlled by the Government of India. It is situated about 10 miles from the mouth of the Karnafuli river in East Bengal. The Assam Bengal Railway connects it with the area behind and it is now recognised as a natural outlet for the trade of Assam and North-East Bengal. Ships of any size can proceed 9 miles up the river at 'High Water Ordinary Spring Tides.' In 1939-40 about 890 ships (1,100,000 tons) visited the port. Imports are valued at Rs. 4,40,44,000 and consist mostly of salt, iron and steel goods and cotton goods. Exports are valued at Rs. 7,90,04,000, the chief items being tea, jute, rice, wax and cotton. Tea is, however, the chief export as the port lies near and is directly connected with the tea-gardens of Assam and north-east Bengal.

6. Coconada is situated on the eastern coast in Madras Presidency some 80 miles south of Vizigapatam (on the head of Coconada Bay) and about 270 miles north of Madras. Large steamers, however, anchor some 7 miles away in the sea, constant dredging has to be maintained in-between. Co-conada exports goods worth about Rs. 1,37,78 000 and imports goods worth about Rs. 94,54,000. The chief exports are cotton which is sent to United Kingdom, and groundnuts which are sent to all continental ports.

7. Cochin is an important port on the Western Coast of India south of Bombay. The number of vessels that touch this port in one year is 2,307 (4,000,000 tons). The system of, back-waters parallel with the coast, affords cheap transport and excellent waterways, connecting several places of importance.

The port handles trade worth Rs. 13,000,000 annually. Recently the harbour has been remodelled and improved at a tremendous cost of several thousand pounds. Since 1937-38, liners of important lines like P. and O., B. I. S. N. line, City Lines and Bibby Lines have been regularly calling at this port.

8. Cuttak (and False Point) is situated about 253 miles from Calcutta at the apex of a triangle formed by the Mahanadi and Katjuri rivers. It is situated on the main line running between Calcutta and Madras. A small canal connects it with Chandhali. Heavier steamers however, go to Calcutta. The port of False Point was closed in 1924.

9. Dhenushkodl is the southern-most point of the South Indian Railway. A regular steamer joins it with Talamanor in Ceylon (21 miles away). In 1934-35, 400 vessels (140,000 tons) called at this port. The number has since greatly increased.

The port handles exports valued at Rs. 254,50,000 and imports valued at Rs. 28,04,000. The chief exports are fish (dry and salted), rice, tea and cotton piece-goods.

10. Masulipatam is the chief port in the delta of the Kistna. It is connected by a branch line with Bezwada on the main Calcutta-Madras line. Large ships can anchor only 3 miles away in a tidal creek. In 1934-35 about 90 ships touched this port. The centre handles imports worth about Rs. 46,000, and exports worth about Rs. 1,32,32,000. The chief exports are groundnuts, castor-seeds and oil-cakes.

11. Tuticorin is only next to Madras and Cochin in south India. It is open all the year round. It also marks the eastern terminus of the South Indian Railway. The harbour being shallow, ships anchor about 5 miles away. Constant dredging has to be carried on to keep the channel clear. In 1934-35 about 500 ships touched this port. Trade includes Rs. 3,10,00,000 worth of imports and Rs. 2,50,00,000 worth of exports. Considerable trade in rice, pulses, onions and livestock is carried on with Ceylon. Fair quantities of raw cotton, tea, and spices are also exported.

12. Vizagapatam is situated about two miles from Waltair, the junction of M. S. M. and B. N. Railways. The new harbour scheme includes having a deep-water area by dredging. The tidal creek that connects it with the sea, has also been deepened and widened. A line connects Vizagapatam with Raipur. A big area in C. P. which is rich in manganese, cotton and oil seeds is saved by this port. The total imports handled by this port amount to Rs. 23,14,000 and the exports amount to Rs. 1,91,72,000. The chief exports include manganese (sent to England, France, U. S. A. China and Japan) and oil seeds.

Vizagapatam is now the centre of a new ship-building industry in India. Its trade is steadily going up.

CHAPTER XII

TRADE

(Internal and Foreign).

1. **Agricultural Marketing.** When the crops have been harvested, the next step is to dispose them off profitably and without any damage to the grain. This primarily involves a study of the marketing and storing practices of the country and then a study of the means of communication and transportation.

The common practice that has been prevalent in India as a whole is quite simple. The farmer, after keeping enough food for his family, sells his grain to the village 'bania' or the wholesale purchaser, who very frequently is in the know of things and pays a very low price to the farmer who is always in an immediate hurry to dispose off his goods lest they be damaged owing to faulty methods of storing. The 'bania', who knows all about the outside prices, earns huge profits.

Of late years marketing in Western countries has become advanced, scientific and complicated, and is not a simple exchange between the producer, the bania and the consumer; but not much of this can be applied to India. We can hardly claim our marketing to be systematic. And in the marketing process mentioned above, the producer is the loser. He has to submit to the terms dictated by the 'bania' who is very often the man to whom the farmer is very heavily indebted.

It is obvious that the more common practice if not the universal one, in pre-British India, when there were no railways and post-offices, was for the grower to exchange his produce for the goods he required. If rent was to be paid to the landlord, it usually took the form of payment in kind. Marketing was based on the isolated efforts of the peasant and the Bania. Organised business centres were non-existent. The cultivator had practically no chances of marketing successfully. The farmer is a necessitous creature and he hurries to sell his crops soon after the harvest and does not wait for better prices because his immediate need is cash, to pay the rent and to pay back some of his ever increasing debt; and secondly because there being no good storage facilities available, he is afraid lest his goods get spoilt.

Perhaps he did not want to go to the distant markets which inevitably involved high expenses; and perhaps he did not know of any profitable means of grain-storage. The regular construction of roads and railways has shortened distances. The opening of the Suez Canal in 1869 has linked him with the European and subsequently American markets. His bargaining power is gradually increasing.

The English eye realised the role of efficient marketing in the rural and agricultural development of the country and appointed from time to time several commissions,* to suggest improvement.

The United Provinces were the first to appoint local marketing officers to collaborate with the central marketing staff. A series of marketing surveys with special reference to the more important commodities, *e. g.*, wheat, sugar-cane, cotton, etc., have been planned out.

*The Famine Commissions of 1880, 1898, 1901; the Irrigation Commission of 1903 and the Committee of co-operation of 1915; also the Royal Commission on Agriculture in India, 1926.

Specialised markets are very few, and those that exist serve as central stations for the collection and distribution of the various crops of the neighbouring areas.

At the top is the Indian Chamber of Commerce, then come the wholesale markets generally called 'Mandis.' The bigger 'Mandis' have their own organisations, while the rest including rural markets are not controlled. The buyers and sellers are left to deal between themselves.

The following table shows the names of the bigger commodity markets in northern India :—

Wheat : Meerut, Muzaffarnagar, Chandausi, Hapur, Hathras, Ghaziabad, Lyallpur, Karachi.

Cotton : Agra, Aligarh, Hathras, Cawnpore, Ludhiana and Amritsar.

Sugar-cane : Bareilly, Shahjihanpur, Cawnpore, Muzaffarnagar.

Hapur is the biggest 'Mandi' in U.P., and together with Amritsar in the Punjab has snatched from Bombay the place of honour in the matter of supremacy in the wheat trade. It has its own Chamber of Commerce, its daily trade news bulletin and its forward transaction. The 'Mandi' also makes efforts towards preventing adulteration of produce, simplifying marketing charges and organising trade on a better footing.

In some villages are found a few local markets where the producers take their produce for disposal. The position of village markets tallies fully with that of the cultivated area. Distribution of grain markets is essentially controlled by the distribution of agriculture and ultimately by geographical environment.

The village markets involve bazar-like dealings rather than organised trade. Mostly the markets are held once or twice a week in some open space, and that day is a day of holiday in the village when all go shopping. They are without a system and involve arduous travels over rough and unmetalled roads which, however, the farmer prefers to going to bigger markets by rail or motor. And the villager prefers selling his produce in these village markets because bringing produce to the big 'Mandis' involves a good amount of money for transport and carriage charges, and then the wholesale dealers quote their own terms which are seldom reasonable, with the result that either the villager has to take back his goods or sell them at a loss.

There is no marked tendency towards co-operative marketing of agricultural produce. Solitary institutions work here and there, but they are hardly able to cope with the demand. More co-operative societies could function on these lines to the great advantage of the cultivator. They could give advance money to the producers until they get a fair value for their produce. Besides, they could educate the cultivator in improved methods of production and pre-

paration of his produce, facilitate the grading of produce and put the backward village farmer in touch with the bigger markets.

The holding of surplus supplies from periods of plenty for periods of scarcity is one of the most essential items in profitable marketing. The economic advantage of storage is that it aids in adjusting variable supplies to the relatively constant needs of the buyer.

Unless storage is safe and free from damage^r by insects, rodents etc., it cannot prove profitable. Cultivators store grain in their houses in earthen pots or in a corner of a small living room. Both the practices are practicable only for small quantities. For bigger amounts 'Khattis' or cells in the ground, or barns are preferred but in both places there is danger of damage. The bigger merchants generally use the latter places. Even in normal years there is a considerable amount of deterioration in the quality of the grain, besides the damage on account of rats, sub-soil damp and the consequent chemical reactions. At Muzaffarnagar Mr. V. S. Mathur was shown round by an official of the Grain Chamber some of the newly built 'Khattis' or storage pits made of reinforced concrete. The official said that these scientific pits are 'water-proof, insect-proof and hygienic. There is a tendency in that market to abandon the old 'Khattis.' These new storage chambers of reinforced concrete in Muzaffarnagar are the first of their kind in Northern India and it is hoped that other big markets like Hapur will soon follow suit.

Both marketing and storage development should be a concern of the agriculturalist and the wholesale dealer; and organised marketing, direct dealing, thereby eliminating the village 'bania' or the middleman, should be encouraged as it brings village prices into greater accord with local 'Mandi' prices, to the benefit of both the producer and the buyer. That private enterprise is not forthcoming, is to be regretted. Any scheme planned and financed by the Government can hardly succeed without the co-operation of the people.

This line of improvement is directly connected with the agricultural development of the country. It will not be very wrong to say that the development in marketing (to enable the producer of the crop to have some profit out of his produce) has a direct bearing on the subject of agricultural development and should go parallel with that of the latter. Unless he gets profits and is sure that if he grows more, he will earn more money, the cultivator will be very reluctant in trying to increase his acreage under crops, or make better use of the irrigational facilities or the other improvements introduced hitherto.

2. INTERNAL TRADE

The full significance of our home or internal trade is not yet fully realised as not much has been done to develop it. While the

Coal, coke, salt, cotton, livestock and cloth are other items of internal trade as all of these articles of consumption are had only in limited areas and are transported to the farthest corners of the country. For example coal is had only in Bihar, but it goes to Bombay, Punjab and Sindh for consumption. The following table gives details about internal trade in other items :

Cement	28,000,000	maunds.
Coal and coke	400,000,000	"
Iron and steel	40,000,000	"
Raw Jute	39,000,000	"
Salt	30,000,000	"
Raw cotton	20,000,000	"
Cotton Piecegoods	12,000,000	"
Hides and skins (Raw)	33,000,000	"
Hides and skins (Tanned)	800,000	"
Gunny bags and cloth	6,000,000	"

About 12 lakhs of Cattle move annually in India mainly by road—by rail only to long distances. A few animals also move by river specially in Bihar, Bengal and Assam. They are sent out to deficit areas as well as for slaughter.

In 1930-31, the total value of coastal trade in India including Burma was about Rs. 89 crores worth of imports and about Rs. 82 crores worth of exports. In 1938-39 after the separation of Burma, it was Rs. 50, crores worth of exports and Rs. 55 worth crores of imports.

Government Marketing organisation :—The Royal Commission on Agriculture made a number of recommendations regarding the internal trade specially regarding agricultural marketing in the country. In 1934 the Government of India appointed an Agricultural Marketing Adviser. Some of the provincial Governments had already ordered marketing surveys and appointed some expert officers. Others carried the same steps on the recommendation of the Advisory Board of I. C. A. R. The work is now proceeding on the following lines :—

1. Co-ordination of all work in the provinces is done by the Central Marketing Officer and his staff of experts. Several reports have already been published.

2. Provincial data is being collected and compiled by provincial marketing staff.

3. Marketing surveys are being carried by (1) and (2).

4. Special committees for staple crops have been appointed and many more may be appointed in the near future.

IMPORTANT TRADE CENTRES.*

There are a considerable number of towns in the interior which deserve mention either as distribution or industrial centres.

1. Calcutta is important from the latter point of view as the centre of the jute manufacturing industry all the jute mills in Bengal being situated within its boundaries or within a few miles on the banks of the Hooghly. There are many flour and paper mills, match factories, chemical works and rice mills, a large number of oil mills, iron foundries, tanneries, etc. The great Tata Iron and Steel Works at Jamshedpur are only about 150 miles from here. Calcutta is also an important centre for the export of tea and is the home of many miscellaneous industries such as soap, perfumery and toilet goods, enamelled and porcelain ware, glassware, celluloid and horn articles, cardboard boxes and tin cans, hats, waterproof cloth, etc. Coal also forms an important commodity of trade. Calcutta exports the bulk of raw hides and skins.

2. The outstanding industrial features of Bombay and its environs are its cotton spinning and weaving mills, dyeing and bleaching works and metal stamping factories and the Hydro-electric works at Lonavla and in the Andhra valley. It is at the same time the chief distributing centre in Western India for very large imports of cotton manufactures. A preponderating share of the trade of Bombay is in Indian hands and the majority of the mills are under Indian management. Bombay is one of the most important markets of oilseeds and has a valuable crushing and oil refining industry. There is considerable trade in oil cakes with the United Kingdom.

3. Madras is of no great importance industrially though it possesses the two most up-to-day cotton textile mills in India. Madras is an exporting centre for groundnuts, flue-cured and other types of tobacco and tanned hides and skins.

4. In Karachi the wheat trade is largely financed by European firms, though Parsees, if to a much smaller extent than at Bombay, have important commercial interests. Karachi is an important distributing centre for the Punjab and Sind wheat.

5. Cawnpore on the Ganges in the United Provinces, is industrially and commercially of great and growing importance. It is an important railway junction and its situation about 870 miles from Bombay and 630 from Calcutta has made it a convenient distributing centre for the imports of Manchester piecegoods, hardware and machinery from both these ports, while its factories produce very large quantities of leather goods, woollen, cotton textiles and tents. The city also boasts of flour mills, oil mills, and chemical works and there are a number of flourishing minor industries.

6. Delhi is now the capital of the Indian Empire. It is the junction for nine railway lines and an important clearing house for

*The *Handbook of Commercial Information for India* (1937)—pp. 109—113 and the *Nalanda Year Book* (1944-45) pp. 208—209 have been freely used.

Punjab and the western districts of the United Provinces particularly for cotton, silk and woollen piecegoods. There are cotton spinning and weaving mills, biscuit factories, and many flour mills. It is noted also for its art industries, such as ivory carving, jewellery, lace work, silversmiths' work, pottery and gold and silver embroidery. Delhi is famous for embroidered shoes and slippers and for its lamb-skin and fur trade. It is also known as a buying centre for milch cattle and buffaloes.

7. Ahmedabad is, next to Bombay, the most important industrial centre in Bombay Presidency. It contains 99 cotton mills.

8. Amritsar 30 miles east of Lahore, is also of considerable importance commercially. Apart from its entrepot trade in piecegoods, a large business in skins and hides is done here and its carpet industry is well-known. Amritsar is an important storehouse for grains and possesses two active "Option" or "Futures" markets for wheat.

9. Agra is chiefly famous for the architectural monuments of the Moghuls though its manufactures of carpets and daris, embroideries, and stone work are considerable. It is also a collecting centre for better qualities of hides.

10. Asansol (in Bengal) is an important railway junction and one of the chief centres of the coal industry in India.

11. Bangalore is in the Mysore State. It is 219 miles by rail from Madras. Its chief manufactures are carpets, cotton textiles and woollen goods and leather. Bangalore has many miscellaneous industries both private and state-aided such as soap, porcelain, shellac, furniture, gasmantles, white lead and cigarettes.

12. Lahore is the capital of the Punjab and though of small importance industrially, apart from the large workshops of the North Western Railway, it is the chief trading centre for the agricultural produce of the province. It tends relatively to lose its place as a trading centre for agricultural produce owing to the development of canal colonies in other districts of the Punjab.

13. Sialkot is the centre of the sports goods industry in the Punjab.

14. Benares, situated on the Ganges about 400 miles north-west of Calcutta, is the holy city of the Hindus. Commercially it is chiefly of interest on account of its great silk weaving industry.

15. Lucknow, is the cold weather capital of the United Provinces. Its industries are small but commercially it is of interest as a distributing and collecting centre for the rich agricultural products of Oudh.

16. Nagpur, on the main line between Calcutta and Bombay at the junction of the Great Indian Peninsula and Bengal Nagpur Railways, is the capital of the Central Provinces. Its commercial importance

is due to its prosperous weaving mills, cotton ginning and pressing factories and the extensive manganese deposits in the neighbourhood. Nagpur is famous for its loose-skinned *sanglara* oranges.

17. Jubbulpore, an important railway junction linking the East Indian with the Great Indian Peninsula Railway, contains a central gun carriage factory, a spinning and weaving mill, a number of pottery works, and railway workshops.

18. Mirzapur, in the United Provinces, boasts of a brass industry for the manufacture of domestic utensils, but it is mainly important on account of its shellac and carpet industries.

19. Madura is the centre of considerable silk and cotton weaving and dyeing industries and is the second town of importance in the Madras Presidency.

20. Vizagapatam has now been declared a major port. Manganese ore, mrvabolan and groundnuts are the chief exports from this port. Tobacco is also exported.

21. Dacca, is the most important city in Eastern Bengal, in the heart of the jute-growing districts. Its muslins were formerly famous in Europe and there are still a number of handlooms working here. It is a large collecting centre for hides and skins.

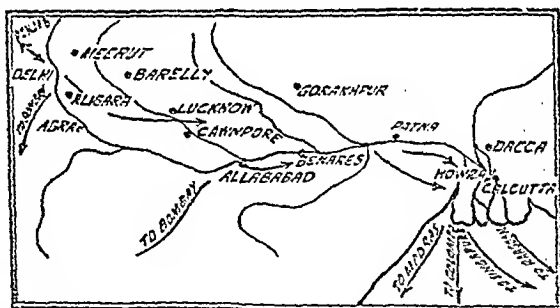


Fig. 51. Some cities of the Ganges Basin.

22. Srinagar, the capital of Kashmir, is situated on the Jhelum river. It is famous for its embroideries and carved wood work, and the largest silk filature in India.

Sholapur and Amraoti are centres respectively of the cotton industries of the Bombay, Deccan and Berar. Other important cities are : Hyderabad, the capital of the Nizam's Dominions and the centre of a considerable cotton trade. Allahabad is an important railway centre. Jaipur in the Indian State of the same name, is the chief commercial city in Rajputana and famous for its artistic pottery and brassware. Baroda, is the Capital of the Gaekwar's territory about 245 miles north east of Bombay. Mysore the garden city of Southern India is famous for the manufacture of sandal-wood oil, silk, ivory and sandal-wood carving and incense sticks.

3. FOREIGN TRADE

While studying the foreign trade of India, one should never overlook the fact that India is mainly a producer of food and raw materials. This fact has been dominating our trade long since the seventh century B. C. In those old days we were trading with countries like Arabia, Syria & Egypt by sea. Overland trade was being carried on with Persia and Babylon. The exports mostly composed of muslins, spices and precious stones. The sea-borne trade decayed considerably during the Muslim period but land trade *via* the North-Western passes greatly developed. During the 17th century many European nations competed for Indian markets but the English came out successful and the East India Company took sole charge of the Indo-British trade. The opening of the Suez Canal in 1869 marks an epoch in the development of our foreign trade. It brought England nearer by about 3000 miles and both the exports and imports began going up steadily. Exports went up from Rs. 60 crores in 1873 to 224 crores in 1913-14; while the imports also went up from Rs. 33 crores to Rs. 151 crores. Now during normal years our foreign trade amounts to about 600 crores*. Only 10 per cent of our entire trade is foreign. Although the trade figures are quite high and India stands fifth in the world, the high population figures keep its *per capita* figure almost at the bottom.

The chief characteristics of our foreign trade are :—

(1) More than 90 per cent of it is sea-borne; carried on through the few Indian ports chiefly :—

(a) Bombay	Rs. 150 crores per year
(b) Calcutta	„ 141 „ „
(c) Karachi	„ 62 „ „
(d) Madras	„ 34 „ „
(e) Cochin	„ 15 „ „
(f) Chittagong	„ 13 „ „
(g) Tuticoria	„ 10 „ „

(2) India's imports mainly consist of manufactured goods as is evident from the following table :—

	Value	Percentage
Manufactured goods	Rs. 93 crores	61
Raw materials	Rs. 33 crores	21
Food	Rs. 24 crores	15
Others	Rs. 5 crores	3

(3) Her exports comprise mainly of raw materials, semi-manufactured goods and food as is given in the following table :—

	Value	Percentage
Raw materials	Rs. 76 crores	45
Semi-manufactured	Rs. 50 crores	30
Food	Rs. 40 crores	23

*In 1941 the total was about Rs. 343 crores, but certainly this cannot be called a normal year with a war going on, with India as an active participant.

(4) Normally there is every year a favourable balance of trade*, which is a necessity for India in that we are to pay out annually heavy charges to foreigners as *Home Charges*, interest and profits on foreign investment in India and other sundry payments. U. K. is our best customer as well as supplier, but normally we purchase more from U. K. than we sell her but in the case of other countries we sell more than we purchase and as such our balance of trade is very favourable. Our average for five years ending 1938-39 was +44. During the war owing to huge exports and low imports it even went up as high as +80 and even +85.

(5) The entrepot trade is of great importance. It amounts to about Rs. 15 crores (and includes articles imported only to be re-exported to the countries bordering India—Nepal, Afghanistan, Tibet, Shan States and Western China). The main items of export to these places are shown in the following table :—

Cotton piece-goods	...	3.7 crores of rupees
Cotton twists and yarn	...	1 "
Metals and manufactured goods	2	"
Grains and pulses	...	1 "
Sugar	...	1 "
Oils	...	15 lakhs of rupees
Railway Material	...	65 "

The trade with our neighbours is usually carried on through the ancient trade routes in the north-western highlands of India—Khyber Bolan, Khuram and Gomal passes. The Nepalese railway system connects with the Indian system at Raxoul and this has brought about a great expansion in the trade between the two countries.

India's trade relations are more intimate with the United Kingdom than with any other country. In the year 1938-39 (it was a very normal year), India got Rs. 46 crores of imports from U. K., this means that U. K. was responsible for about 30 per cent of our total imports. In the same year our exports to U. K. amounted to Rs. 55 crores i.e., about 35 per cent of the total exports. The total trade with U. K. comes upto about 33 per cent of the total foreign trade of India.

The British Empire† accounts to about 60 per cent of our imports and about 55 per cent of our exports. During the war years, the exports naturally increased to about 70 per cent while the imports decreased to about 45 per cent. The following table gives details about our trade‡ with the empire.

*Difference between exports and imports.

†Including U. K.

‡Excluding re-exports.

	Imports	Exports	
	Lakhs of rupees.		
Burma	... 23,35	10,03	/
Ceylon	... 1,18	5,09	n
Australia	... 2,41	2,97	ts
Canada	... 91	2,14	im
South Africa	... 35	1,49	est
Others	... 12,87	8,14	per

Amongst other countries U. S. A. (978 lakhs of rupees worth of imports and Rs. 13,18 lakhs of exports), Japan (15,41 lakhs of rupees worth of imports and Rs. 14,59 lakhs worth of exports) and Germany are our chief trade allies. Iran, Egypt and others are also having some trade with us. The following may be studied to some advantage (1838-39).

Imports			Exports		
Country	Value in 1000 of Rs	Percentage	Value in 1000 of Rs	Percentage	
U. S. A.	977,83	9.7	13,88,00	12.8	yes
Japan	15,41,34	11.7	14,59,02	9.9	re
Germany	12,92,73	9.7	8,55,49	4.7	
Iran	3,48,84	2.5	78,37	0.2	as
Egypt	2,18,89	1.5	1,22,50	0.5	m
France	1,40,14	0.9	6,19,18	4.0	of

Till the eighties of the last century, the empire practically monopolised the imports into the country. Only about 7 per cent came from outside. U. K. alone was responsible for about 82 per cent. In the case of exports, however, the empire did not start so high—only about 60 per cent was its share. U. K. took on about 45 per cent of our exports. During the present century number of European countries especially Germany have come into the field as keen rivals. In 1914 about 60 per cent of our exports went to non-empire countries. U. K. got only about 25 per cent.

Between 1918 and 1939, the position of U. K. and other empire countries became even worse in spite of the so-called policy of Imperial Preference and the famous Ottawa Agreement both of which aimed at increasing the share of the countries within the British Empire. U.S.A.'s share was more than doubled.

The second Great War meant the cessation of trade with the continent and later on with Japan, Burma and other occupied countries. The relative share of the empire countries has increased. That of U. K. has steadily gone down. U. S. A. gained its share which came up to 20 per cent. in 1941-42. Imports for the surrounding countries increased particularly from Egypt and the Middle East countries. Iran alone accounted for 16 per cent of our imports.

*More particularly Ceylon, South Africa and Australia.

Imports

The total imports during 1932-33 amounted to Rs. 133 crores, the items being cotton and cotton goods (Rs. 34 crores), machinery, (11 crores), oils (Rs. 8 crores), metals and ores (Rs. 10 crores), automobiles (Rs. 4 crores) and sugar (Rs. 9 crores). The *per capita* is Rs. 3-8 for imports. The following table gives the pre-war year import figures (in thousands of rupees) of certain imports.

	1938-39	...	1942-43
Food, Drink and Tobacco	2,400,55	...	7,61,71
Grain, pulse and flour	13,76,46	...	30,85
Tobacco	1,04,55	...	1,33,19
Raw materials and Produce	38,11,46	...	51,94,84
	15,62,41	...	27,78,12
Cotton	8,50,92	...	15,42,48
	62,17	...	1,73
Oil	62,11	...	2,95,50
Timber and timber	2,58,06	...	16,24
Manufactured Goods	1,52,32,58	...	1,10,44,83
Chemicals and drugs	5,62,05	...	6,39,09
Armaments, etc.	5,81,48	...	3,25,32
Machinery	19,72,48	...	10,52,60
Iron and steel goods	6,65,62	...	2,77,15
Paper and goods	3,89,97	...	2,15,67
Rubber goods	1,40,57	...	.....
Vehicles	6,69,20	...	5,71,83
Cotton including yarn	14,15,27	..	1,36,71
Silk	1,31,98	...	.....
Woollens	2,19,78	...	.....

Imports analysed :—Cotton goods and yarn comes chiefly from the United Kingdom and Japan—32 per cent and 55 per cent respectively during pre-war years. During the war imports were stopped from Japan and those from U. K. came in very low quantities. China is also responsible for about 7 per cent. Other countries involved are Holland, France, Italy, Germany, U. S. A. and Switzerland.

The chief items of import are cotton piecegoods (70%), twist and yarn (10%), hosiery, millinery, thread and blankets.

With the increase in the production of cotton goods in India, the imports have been gradually going down. The imports of cotton piece goods in 1936-37 were one-fourth of those in 1913-14 and more than half of this came from Japan. In 1936-37 the *per capita* consumption was 15.53 yards out of which only 2.13 yards were of foreign origin. In the post-war years, the imports may be further reduced as local production is bound to go up tremendously.

Iron and Steel Goods :—(a) *Machinery and millwork* form important items of imports amongst iron and steel goods. More than 15 crore rupees worth of these goods are imported into India every year. The United Kingdom is alone responsible for more than 60 p. c. of these goods. Next come Germany (pre-war) with its 15 p. c. share ; U. S. A. (8 p. c.), Japan, (3 p. c.), and Belgium (2 p. c.) were other suppliers. Belgium is, however, our best supplier of steel, while U. K and U. S. A. supply iron. 80 per cent of machinery about 90 per cent of rolling stock and railway plant and more than 40 p. c. of hardware come from U. K. and U. S. A. Large supplies of mill machinery come from U. S. A.

The imports of machinery have ever been on the increase, which is a sure sign of our rapid industrial development. It is, however, desirable that our dependence on foreign countries with regard to the supply of capital goods were reduced. Small beginning have already been made in this direction in the country.

(b) *Vehicles* valued at about Rs 7 crores were imported into India in 1936-37. The average for 1927-28 to 1936-37 was Rs. 5.80 crores. The supplies included motor-cars, omnibuses, cycles, carriages and wagons. United Kingdom, U. S. A., Italy and Germany were our most important suppliers.

(c) *Metals and Ores* are also imported. In 1936-37, 363,000 tons of iron and steel were imported. This shows a vast decline from 1909-10 to 1913-14 average about 808,000 tons. 221,000 cwts of copper were also imported in 1936-37. This too shows a decline as in previous years as much as about 500,000 cwts were imported. Most of these imports come from Great Britain, Germany and U.S.A.

Oils also form an important item of import. About Rs 8 crores worth of oil was imported in 1936-37. Out of this about Rs. 6 crores worth were mineral oils. Most of our petroleum comes from Burma. During pre-war years Burma sent us about 60 p. c. of our petroleum imports. Other suppliers were Iran (15 p. c), Borneo (13 p. c.) and U. S. A. (7 p. c.) The following table (as quoted by Dubey) shows the details of our oil imports :

Kerosene oil	... Rs. 3.82 crores
Fuel oil	... " 2.08 "
Lubricating oil	... " 1.67 "
Petrol (special)	... " 0.31 "
Coconut oil	... " 0.56 "

An Analysis of Our Chief Exports.

The chief items of exports are :

1. Cotton (raw and manufactured)
2. Tea.
3. Jute (raw and manufactured)
4. Hides and skins.
5. Oil seeds.
6. Grains.
7. Lac and Shellac.

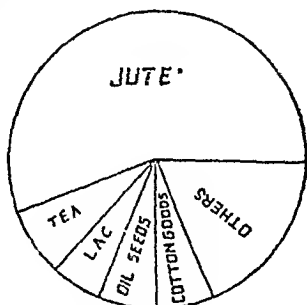


Fig. 52. Exports.

More than 30 per cent of the above-mentioned exports go to Britain. Then come :—

(1) Japan	... 15 p. c.
(2) U. S. A.	... 10 "
(3) Germany	... 5 "
(4) France	... 4 "

(1) Cotton is exported both raw and in the shape of piece-goods, twist and yarn and other cloth.

More than 50 per cent of our raw cotton went to Japan. The pre-war export of raw cotton was reported to be about Rs. 43 crores worth. Then comes United Kingdom with its 17 per cent. The following table shows other customers :—

U. S. A.	... 3 p. c.
Germany	... 5 "
France	... 7 "
Italy	... 4 "
Belgium	... 5 "
China	... 20 **,*

Most of our raw cotton went out *via* Bombay and Karachi. Calcutta was not very far behind.

Bombay	... 50 p. c.
Karachi	... 29 "
Calcutta	... 20 "

It is interesting to know that even in pre-war years the cotton consumption in the Indian mills was steadily increasing.

1933-34	... 2,289,930 bales of 400 lbs. each
1934-35	... 2,553,440 " " "
1935-36	... 2,609,378 " " "
1936-37	... 2,612,024 " " "

The details of the exports of manufactured cotton are :—

Piece-goods	... 3 29 crores of rupees
Twist and yarn	... 1 18 " "
Cotton waste	... 48 " "
Handkerchiefs	... 28 " "

Our annual production of piece-goods is about 3,500 million yards; out of this about 102 million yards were exported in 1936-37 as compared with a mere 71 million yards in 1935-36. The Indian piece-goods mostly go to Ceylon, Iran, the Straits Settlements, Iraq, Aden, Arabia, Malay States and the Anglo-Egyptian Sudan.

Our chief customers of twist and yarn are Syria, Iraq, the Straits Settlement, Aden and Cyprus.

(2) Tea is another important item of export. Out of the total production of 400,000,000 lbs. of tea, about 77 per cent was exported in 1936-37. Great Britain is our best customer, taking 276 million pounds out of the total exports of 313 million pounds. Our other customers are Canada, U. S. A., Australia and New Zealand.

*Average of 1935-39.

Calcutta is the most important tea-exporting port of the country, clearing more than 60 per cent of the exports. Other ports important for the same are Chittagong (24 p. c.) and Madras (16 p. c.)

(3) Jute is also an import item of our export trade. The total exports of raw and manufactured jute in 1936-37 were about 1,792,000 tons valued at about Rs. 43 crores

The amount of raw jute exported is estimated at 821,000 tons valued at Rs. 14.77 lakhs. Our best costumers of raw jute in 1939 were :—

U. K.	... 37.2 p. c.
Germany	... 4.6 "
U. S. A.	... 10.2 "
Belgium	... 5.0 "
Italy	... 6.9 "

Other customers are Spain, France, Argentine, Japan and Canada.

On account of some substitutes being used in U. S. A. and other places, the exports have been showing a downward tendency.

(4) Hides and Skins may also be mentioned as important items exports from India. In 1936-37 about 76,600 tons were exported. The average export of raw hides and finished leather was worth about Rs. 4.35 crores. The average annual export of raw and tanned skins* amounts to about 4.32 crore pieces valued at Rs. 5.79 crores i. e., India contributes 22.7 per cent of the total number of skins involved in the world trade.

The United Kingdom is our largest consumer, taking more than 60 per cent of the total. Other customers are U. S. A., Germany, Japan and France.

(5) Oilseeds are yet another item of Indian exports. About 1,155,000 tons valued at Rs. 18 crores were exported in pre-war years. The chief items were :—

Groundnuts	... 11 crores of rupees
Linseed	... 3.4 " "
Castor	... 1.47 " "
Linseed cake	... .51 " "
Groundnut-cake	... 1.30 " "
Rape seed	... .88 " "
Rapeseed-cake	... .30 " "

Britain is our best customer and buys about 33 per cent of our total exports. Other customers are (1937).

Italy	... 13.3 p. c.
Germany	... 12.0 "
France	... 10.0 "
Belgium	... 5.0 "
U. S. A.	... 1.4 "

*Both goat and sheep skins but mostly goat.

With the development of the oil-seed crushing industry in the country, our internal consumption has been going up and our exports are on the decrease. The decrease is also seen into effect because of the supplies of oil-seeds from Brazil, Argentine and the Union of South Africa.

(6) Grains and flour may also be mentioned. In 1936-37 the total value of exports under this head was Rs. 1538 lakhs. The items included were :

- (1) Husked and unhusked rice.
- (2) Wheat and wheat flour.
- (3) Pulses.
- (4) Barley.
- (5) Millets.

A larger percentage of our food grain exports go to the United Kingdom, Ceylon, the Strait Settlements, Japan and Germany. Australia, Canada, U. S. A. and Argentine are our formidable competitors in the world markets.

(7) India enjoys a monopoly in the export of lac and shellac as has already been pointed out in the section on 'Lac Industry'. The exports in 1936-37 amounted to about 800,000 cwts. Owing to formidable competition from a number of artificial products, the exports show a gradual decrease. More than 30 per cent of the exports pass through Calcutta. Our best customers are U. K., and U. S. A. Germany and Japan also purchase quite large quantities.

LAND-BORNE FOREIGN TRADE

The Indian land frontier in the North-West and North-East is about 6000 miles long but owing to high and difficult mountains and dense forests, the traffic is restricted to only a few passes specially in the North-West. It is through these routes that the bulk of our land-borne Frontier trade is carried on. The value of this trade is estimated to be about 40 crores of rupees and it is on a gradual increase. The countries involved in this trade are the adjoining countries of Nepal, Tibet, Shan States, Western China, Thailand (Siam), Afghanistan and Central Asia and Persia. The chief items of export are cotton and cotton goods, food-grains, iron and steel and goods, petroleum, sugar, salt, tea and tobacco, hides and skins, fruit and vegetables.

It is expected that with better means of communication, this category of our foreign trade will go up tremendously both in volume and in value.

RE-EXPORT TRADE

Re-export trade usually consists of those items of special foreign production, which because of geographical situation or trade organisation, are halted at an intermediate station to be re-exported from

there*. The value of this trade in India is about 15 crores of rupees.

1938-39	... 6.5 crores
1939-40	... 9.5 "
1940-41	... 12.0 "
1941-42	... 15.3 "
1942-43	... 7.0 "
1943-44	... 11.0 "

Re-export has long been an important feature of Indian commerce because primarily of its geographical situation because of which it is easily accessible from the West and also from the Far East. About 50% and more of our re-export trade is carried on with some of the neighbouring Asiatic countries. The chief items of this trade are fish, fruit, food-grains, tea, sugar, ammunition, drugs and chemicals, machinery and railway goods. The bulk of this trade passes through Bombay (78 p. c.), Karachi (12 p. c.) and Calcutta (6 p. c.). The following table shows percentage share of various countries :—

U. K.	... 49
U. S. A.	... 11
Ceylon and Aden	... 5
Japan	... 4
Iraq	... 4
Arabia	... 3
Iran	... 3
Kenya Colony	... 3

OCEAN TRADE-ROUTES AND PORTS

The chief sea routes of India are

- (1) The Suez Route from and to the West.
- (2) The Singapore Route from and to the Far East.
- (3) The Australian Route (to Brisbane, Sydney and Melbourne).
- and (4) The South African or the Cape Router.

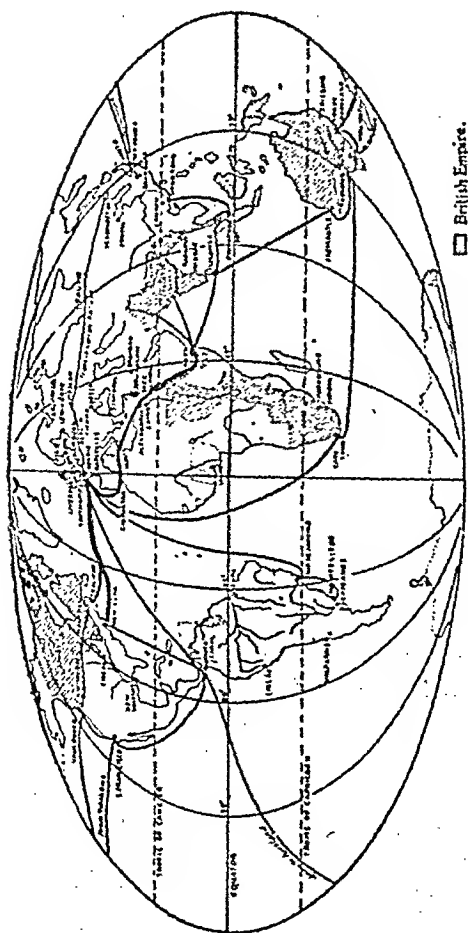
All of these sea-routes radiate from the four Indian ports *i. e.*, Bombay, Karachi, Madras and Calcutta.

The greatest innovation in our sea travel has been the opening of the Suez Canal in 1869, before the opening of which, all the traffic between India and the West was carried on *via* the Cape of Good Hope in the extreme south of South Africa. The opening of the Suez Canal has brought Bombay nearer to Liverpool by about 4,541 miles and nearer to New York by about 3,409 miles.

The Suez Canal is 104.5 miles in length and as such it is the longest ship canal in the world. It connects the Red Sea with the Mediterranean and passes through two salt lakes. The canal has a minimum depth of 36 feet and the minimum bottom width of 100

*Shah, K. T., Trade, Tariffs and Transport—p. 95.

†Some ships go on to South America *via* this route.



□ British Empire.

Fig. 53. Ocean Routes.

feet ; as such there is only one way traffic for bigger ships and they pass through in turns. It takes about 14 hours to cross it as the ships have necessarily to go slow.

More than 6000 vessels of all description pass through the canal in a year ; about half of these being British for the simple reason that India, Australia and other British possessions are in the East.

Ports. Besides the smaller ports described earlier in this book, India has four major ports *i.e.* Calcutta, Madras, Bombay and Karachi that handle about 90 per cent of our foreign trade. Bombay and Calcutta together account for about 65 per cent.

The following table, showing exports and imports of the chief Indian ports, may be useful to learn :—

		Imports	Exports
		(in 000 rupees)	
Bombay	...	70,56,70	76,67,21
Calcutta	...	53,05,09	106,72,03
Karachi	...	15,66,29	19,79,03
Madras (Fort St. George)		14,70,07	15,71,17

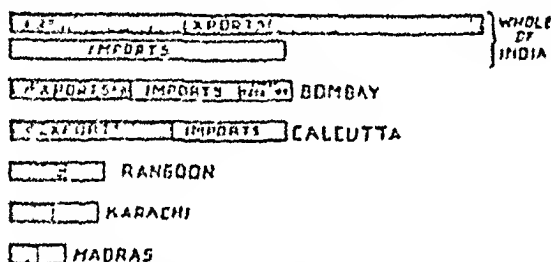


Fig. 51. Exports and Imports.

Bombay along with Karachi controls practically the entire length of the Western Coast and the entire foreign trade of N. W. and Western India is carried on through these ports.

The port of Bombay owes its great importance both to its suitable geographical situation—it is the first Indian halt on the Suez route from the West—and to its magnificent natural harbour having a good minimum depth (32')* and a safe landing place. Its importance as an industrial and commercial centre rapidly went up after the construction of the G. I. P. and the B. B. and C. I. railways which linked it up with the cotton fields of the Deccan and with the cotton and wheat fields of the Punjab and U. P.

The present Bombay harbour situated on the sheltered side of the island of Bombay, is about 14 miles in length and about 5 miles in width†. The harbour contains three wet and two dry docks.

*Indeed equal to the maximum available in the Suez Canal.

†The extreme range of tide is 18 feet and 7 inches; and the range between high and low tides is 12 feet.

‡The total floor area of the sheds is 2,500,000 square feet.

Wet	1. Prince's Dock with a water area of 30 acres and 14 births.				
	2. Victoria Dock	25	16		
	3. Alexandra Dock	49½	23		
Dry	4. Merewether				
	5. Hughes				

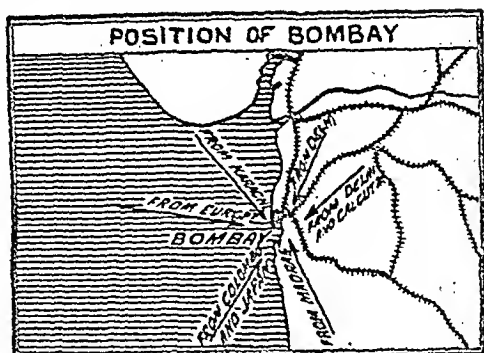


Fig. 55.

The port handles about five million tons of cargo annually. The Port Trust Railway handles about 50 per cent of the rail-borne traffic of Bombay. This railway is only about $7\frac{1}{2}$ miles in actual length but contains about 120 miles of main lines and sidings. The Cotton Depot and the Grain Depot are important items to be described. The former covers an area of about 127 acres and as such claims to be one of the largest in the world. The latter lies to the east of the former across the Port Trust Railway. It covers an area of 80 acres. Besides these, there is a number of smaller depots for coal, manganese ore etc.

Bombay is the main outlet for the products of Western India—more particularly raw cotton. The cotton goods of the mills in the Bombay Presidency are also sent out from here. Because of its excellent railway (Broad Gauge) connections, it also attracts products that 'geographically' fall within the control of Karachi. Besides, being the nearest port of call for the steamers from the West, it is also the most convenient centre for vessels coming from East and South Africa. During the present war the port has gained importance as a military base and it is expected that this will be maintained as a permanent feature.

It may, however, be interesting to note that although now Bombay claims to be the number one port of India, it was second to Calcutta only two decades and a half ago *i. e.*, upto the last Great War. Since then, however, it has rapidly gained in importance owing mainly to her increasing industries.*

*In 1938 the total foreign trade of Bombay was Rs. 150 crores worth as compared to 130 crores of 1939.

The following tables show the 1934-35 import and export figures of Bombay :—

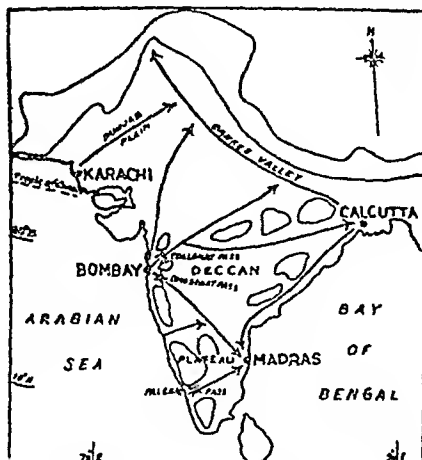


Fig. 56. Chief Ports of India.

A. Imports

Coal	...	197,000 tons
Cotton	...	741,000 bales of 400 lbs. each
Hardware	...	20,000 tons
Iron and Steel	...	80,000 "
Machinery, railway goods etc.	...	91,000 "
Oil, fuel	...	49,800,000 gallons
Kerosene oil	...	46,379,000 "
Piece-goods	...	326,000 bales
Twist and yarn	...	101,000 "
Glassware	...	119,000 packages
Automobiles	...	18,000 "
Paper etc.	...	243,000 "
Wines etc.	...	1,479,000 gallons

B. Exports

Raw cotton	...	1,924,000 bales
Grain	...	167,000 tons
Ground-nuts	...	80,000 "
Hides	...	2,000 "
Iron	...	35,000 tons
Manganese	...	54,000 "
Piecegoods	...	364,000 bales
Seeds	...	254,000 tons
Twist and yarn	...	105,000 bales.

Karachi is the second important port of Western India. Its rise to importance, however, is quite recent. It was only since 1907 that it was recognised as a major port. The opening of the

Lloyd Barrage in 1932, has given it a further push forward. As has already been mentioned in the chapter on 'Air Transport', since 1929 when air services were established between India and some foreign countries, Karachi has become gradually a very important airport and is steadily heading towards the top position in this matter.

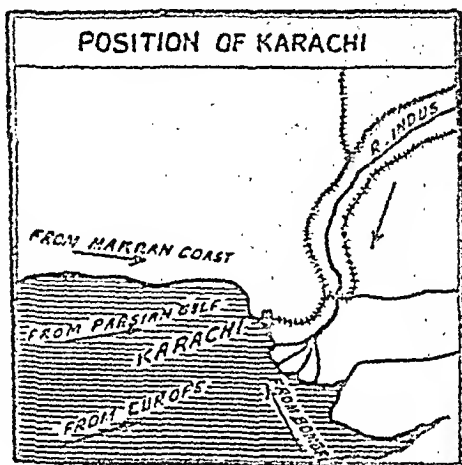


Fig. 57.

Karachi's position (see Fig. 57) makes it the natural outlet for North-West India specially Sindh and the Punjab. One good point in its favour is that it is situated outside the delta of the Indus away from the place where silt is deposited and as such the harbour is always clear and no extensive dredging is resorted to. The North-Western Railway provide transport facilities with its hinterlands which are famous for wheat, cotton and fruit.

Karachi's expansion, however, has been considerably held up because of (1) superior attractions of Bombay, (2) no broad-gauge communications with the United Provinces, (3) absence of industries and (4) limited water-supply.

Karachi is, however, the 'wheat port' of India and its dry and bracing climate is good for storage. Dr. Vera Anstey remarks*, "It is interesting to note that in 1926 more than one-half of Karachi's exports were shipped by foreign vessels (*Times*, May 24, 1927). Apparently British shippers neglect Karachi's potentialities".

In 1939-40, about 10,727 ships weighing about 5,155,000 tons visited this port. The total value of trade is about Rs. 34 crores. The following table† gives the trade figures for 12 years from 1923-24 onwards.

*Anstey, *The Economic Development of India*—p. 151.

†The deficits in the years 1931-32, 1932-33 and 1933-34, were due to slump in trade caused by the world economic depression. The years 1934-35 showed a welcome improvement.

Years.		Import.	Export.
		£	£
1923-24	...	25,615,237	34,261,255
1924-25	...	30,364,640	42,811,673
1925-26	...	26,931,043	29,096,454
1926-27	...	28,464,907	21,822,520
1927-28	...	31,252,326	26,109,315
1928-29	...	32,971,312	25,343,802
1929-30	...	29,632,150	23,007,750
1930-31	...	25,977,312	17,450,473
1931-32	...	32,154,320	14,703,654
1932-33	...	19,975,062	13,254,487
1933-34	...	16,634,442	15,155,730
1934-35	...	18,783,054	18,309,946

The following table gives Karachi's main imports and exports.

<i>Imports</i>		<i>Exports.</i>
Cotton goods	...	Wheat
Sugar	...	Wool
Metals	...	Hides and bones
Machinery	...	Cotton
Oil	...	Oil-seeds
Woollen goods		
Liquors and wines		
Chemicals and drugs		

Madras.* Madras is situated near the south-east corner of India at a distance of about 759 miles from Calcutta, 1,453 miles from Bombay and about 1,915 miles from Karachi. Colombo in Ceylon is about 580 miles away. It can be easily seen from any map that its position puts it in a very favourable position for trade with Burma, Malaya and the Far East and also with Africa and Australia.

It is interesting to learn that though Madras has always been a port, it is not a harbour. It has now an artificial harbour (Fort St. George) which is now visited by 1,416 vessels, weighing about 5,104 000 tons, every year. The harbour, as it is today, consists of two concrete works projecting into the sea, enclosing a sea space of about 200 acres, capable of accommodating about 14 ships. The harbour boasts of seven wharves, and mooring berths, an area of about 16 acres is covered by warehouses.

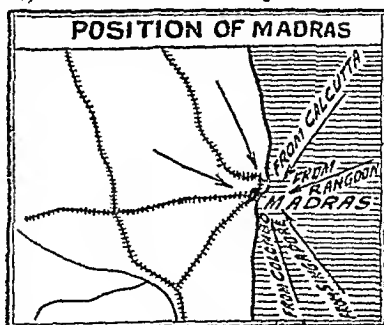


Fig. 58.

* 'Port of Madras' by C. C. Armstrong. The Journal of Madras Geographical Association—Vol. XIV No. 1, 1939—has been freely used in this section.

The harbour is connected with the broad-gauge system of the Madras and Southern Mahratta Railway on one side and the metre gauge system of the South Indian Railway on the other side. Railway sidings are amply provided for sheds and quays, so that cargo may be discharged into or out of railway wagons directly by steamers.

Madras handles imports worth Rs. 14,70,07,000 and exports worth Rs. 15,71,17,000 every year. The following table shows the chief imports and exports of this port.

<i>Imports</i>		<i>Exports</i>	
Rice	...	Ground-nuts	
Foodgrains	...	Skins and hides	
Coal	...	Onions	
Oils	...	Tobacco	
Paper and stationary	...	Raw cotton	
Sugar	...	Ores	
Timber	...	Scrap iron	
Chemicals	...	Kerb stones	
Glass-ware	...	Cotton goods	
Machinery	...	Oil cakes	
Motor vehicles etc.	...	Coffee	
Cotton goods	...	Manures	
Rolling stock	...	Turmeric	

Calcutta (22° N and 88° E) is situated on the Hoogly in Bengal at a distance of about 80 miles from the shore. Besides being a very important port, Calcutta is also the premier city in India and was upto 1911 the Imperial capital. Like other estuary ports, shipping here is at the mercy of the tides. Ships can come and go only at certain fixed times according to the timings of the tides. The sand bars* in the river determine the size of the ships.

Calcutta stands at the head of the Indo-Gangetic Plain which is not only the most fertile and economically important region of the country, but which is also the most densely populated area in India.

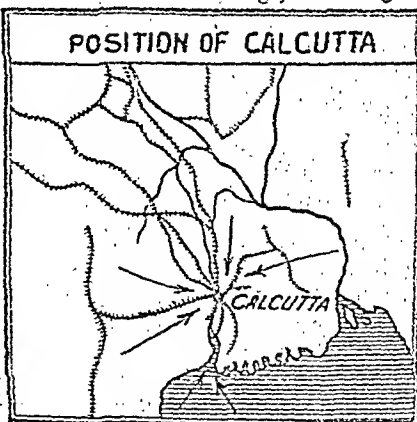


Fig. 59.

*The following bars etc. are encountered on the way to the sea :—Panchpore crossing, Sankrall crossing, Munikholi crossing, Pir Seraog crossing, Poojali crossing, Mayapur Bar, Rayapore crossing, Fulsa crossing, the James and Mary Bar, the Saugor crossing and the Middleton Bar.

The port serves the great jute, tea and coal industries of the eastern half of the Gangetic plains, as also the wheat and cotton traffic of Bihar and United Provinces. The East Indian Railway, the Bengal Nagpur Railway and the Eastern Bengal Railway all combine to connect Calcutta with its rich hinterlands. The Ganges and the Brahmaputra and their tributaries provide splendid natural waterways connecting the delta with the interior of Bengal and Assam.

The port extends for several miles along the banks of the Hoogly. It is well served by the port railway which has 170 miles of permanent way and connects with all the main railway systems serving Calcutta. A number of jetties, docks and moorings exist where vessels can discharge. The Kidderpore Docks, the King George's Dock and the Dock No. 1 and 2 may be mentioned amongst the chief wharves. The Garden Reach Jetties are the latest additions to the port. A number of Dry Docks are also available for the use of shipping. Extensive warehouse accommodation is available in the port—2 sea warehouses and a number of public sheds and a grain and seed-depot.

In 1939-40, 2,968 vessels of all descriptions weighing about 9,061,000 tons visited the port. In 1938 the port carried on trade upto the value of about Rs. 140 crores, out of which exports were valued at Rs. 85 crores and imports at Rs. 55 crores. The following two tables taken from the Handbook of Commercial Information for India (1937) give the details of exports and imports for the year 1934-35. They are given just to show the general trend and not to give the latest figures.

TABLE A

Imports

<i>Item</i>	<i>Quantity or value</i>	
Cotton Piecegoods	yds.	497,534,056
Metals and ores	tons.	175,702
Oils	gals.	109,627,312
Machinery and millwrok	£.	3,306,562
Chemicals etc.	cwts.	1,388,186
Hardware	£.	758,111
Insrtuments etc.	£.	1,285,553
Provision and oils	cwt.	327,591
Paper and paste board	cwt.	868,000
Motor vehicles	Nos.	4,433
Woollen goods	£.	555,844
Liquors	gals.	1,234,064
Rice	tons.	572,280

determine the population of a country, but as far as our country is concerned agriculture seems to be the major consideration, while just the opposite is the case in England, which is industrial in appearance, in outlook and in the distribution of population.

The population of our country stands at a high level, nearly $\frac{1}{2}$ of the total world population is found in this country. Its population according to the census of 1931, was about 350,000,000 (Three hundred and fifty million)-British territory 270,000,000 and Indian States 80,000,000. The total population of India, according to the 1941 Census, is 388,997,455 souls, of these 93,189,233 live in Indian states and 295,808,722 in British provinces. The total area of India (excluding Burma) is 1,581,410 square miles. Statistics of the total population, according to political divisions are given below.

Areas and Populations.

	Area (sq. miles)	Population
All India	1,581,410	388,998,000
Assam	54,951	10,205,000
Bengal	77,442	60,307,000
Bihar	69,745	36,340,000
Bombay	76,443	20,850,000
C. P. and Berar	98,575	16,814,000
Madras	126,166	49,342,000
N. W. F. P.	14,263	3,038,000
Orissa	32,198	8,729,000
Punjab	99,089	28,419,000
Sindh	48,136	4,535,000
U. P.	106,247	55,021,000
Hydrabad	82,313	16,339,000
Mysore	29,458	7,329,000
Kashmir	82,258	4,022,000
States (total)	715,964	93,189,000

Increase in Indian Population. During the last 50 years the population of India has grown by 110 millions as is clear from the tables below :—

TABLE A

POPULATION IN INDIA (MILLIONS).

	1891	1931	1941	Percent increase since 1891
Total	279	338	389	39
British Provinces	213	257	296	39
Indian States	66	81	93	40

TABLE B

Percentage variations from decade to decade :

1891—1901,	1901—1911,	1911—1921,	1921—1931,	1931—1941,
+1.5	+6.7	+0.9	+10.6	+15

TABLE C

INCREASE DURING 1931—41

Madras	11.6 p. c	C. P.	9.8 p. c.
Bombay	15.8 „	Assam	18.3 „
Bengal	20.3 „	Orissa	8.8 „
U. P.	20.5 „	N. W. F. P.	25.3 „
Punjab	20.5 „	Sindh	16.7 „
Bihar	12.3 „	Baluchistan	8.2 „

It will be seen that the growth of population from decade to decade has been slow and irregular, the governing factors have been famine or epidemics. Their prevalence has been a restraining influence and their absence responsible for a substantial increase. Between 1891 and 1901 the twin factors of plague and famine checked a rapid growth in numbers. The decade 1901—1911 experienced a fair degree of agricultural prosperity and thus registered a higher increase. The prospects of increase in the next decade (1911—1921) were marred by influenza which raged in an epidemic form. But for this calamity which is estimated to have taken a toll of 14 million persons, population in India would have considerably increased. It seems the increase in numbers during the first seven years of this decade was neutralised by this disease during the closing years. Since 1921, however, the population has increased at a very rapid rate. Nature seems to have been less unkind. Perhaps the methods of conquering epidemics have been perfected. Better irrigation facilities have mitigated famine conditions. A part of this may be attributed to increase in the area of census operations and improvement in the census methods. Even making an allowance for these factors the real increase in population seems to be fairly alarming. Although the census commissioner considered 7 to 8 per cent. for the decade as the rate of probable increase, to us however, 10 per cent seems to be the normal rate of decennial increase. Considering the huge size of our population, this rate is sufficiently perturbing. The increase has not been uniform in all parts of India, although higher rates are universal

“ Rates are noticeably higher in the north than in the south and have two extreme peaks in the extreme west and north-west and in the east. In fact, we have in the Punjab and Eastern Bengal two swarming areas. Both are comparatively young from the habitation point of view.”*

*Census of Indian Report, 1941. Vol. I, p. 23.

Let us examine geographically the causes that have been responsible for the rapid growth of numbers during the last 20 years or so.

(a) The new irrigation schemes in the Punjab have thrown open considerable semi-desert areas to new colonization. The process started from almost zero, and is going on at a remarkable speed. The same was the fortune of the U. S. A. and Canada when the human tide first flowed in from Europe. The new colonies in the Bikaner State have attracted the Sikh farmer who has been responsible for a 40 per cent increase. Bahawalpur has fared similarly. In Western Bengal with increased agricultural capacity the numbers have multiplied rapidly.

(b) The 1931 Census was taken during a period of political disturbances. The Civil Disobedience Campaign was responsible for leaving many persons unregistered. The leakage was the greatest in North India. All that slack has been caught up, hence the greater increase in density in North India.

(c) In 1941 the country as a whole was census conscious and no one wanted to be missed in the count. In fact, it has been suspected that misjudged communal enthusiasms vitiated enumeration and exaggerated figures were supplied in certain urban areas. The house lists were used for comparative corroboration and "sound enough results were obtained" in spite of the difficulties.

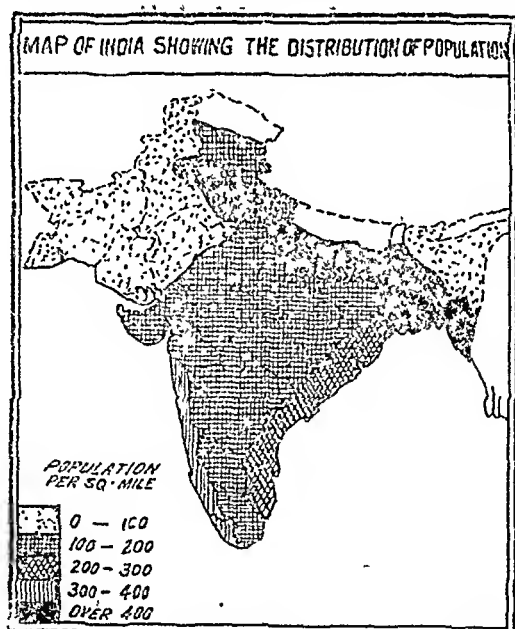


Fig. 61.

Density of Population. The number of persons per square mile varies from province to province and from state to state. We find such extreme variations as Baluchistan with 9 persons per square mile and Bengal with as many as 779.

Density of Population.

All India	...	...	246
States	...	...	130
Madras	...	...	391
Bombay	...	...	272
Bengal	...	...	779
U. P.	...	...	518
Punjab	...	...	287
Bihar	...	...	521
C. P. and Berar	...	...	170
Assam	...	...	186
N. W. F. P.	...	...	213
Orissa	...	...	271
Sindh	...	...	94
Ajmer	...	...	243
Baluchistan	...	...	9
Delhi	...	...	1,599

Density is governed, in the first place, by climate. A healthy climate will attract more people and maintain the existing population. If climate happens to be unfavourable as is in Assam, the density will be low.

Secondly, the density of population depends on rainfall. If rain is adequate, timely, and evenly distributed, it will be highly conducive to the growth of numbers. But rainfall is not the only determining factor. In the Himalayan areas like Dehra Dun, Almora, and Simla, the rainfall varies between 60 and 85 inches in the year, yet the numbers per square mile are very few. Similarly in Assam where the rainfall is plentiful, the density is only 186. The same is true of Kashmir which has a density of only 49. The fact is that no single factor can explain the variations in density. It is only a happy combination of several factors which accounts for higher density.

Thirdly, the irrigation facilities which stabilise agricultural conditions lead to denser population. The canal colonies in the Punjab are much more densely populated than some of the other districts.

Fourthly, economic development leads to dense population and the absence of it accounts for sparse population. It is admitted that the number of people that can be maintained in the pastoral stage must needs be very small. In the agricultural stage larger numbers

can be supported. But in the industrial stage there is room for many more people. It is well-known that all centres of trade and industry happen to the mostly densely populated. The higher density in Bengal is partly due to this factor and a comparatively lower density in the Punjab is due to the agricultural character of the province.

Fifthly, the nature of the soil also makes a difference. Regions with sandy soil show a lower density as compared with those with fertile soils. Rajputana for instance is very sparsely populated.

Sixthly, perhaps the most important single factor having a bearing on density is the configuration of the area. It is the shape of the surface of the earth which largely explains variations in density. The hilly and the mountainous tracts in the north-east or north-west are less densely populated than the level plains of the Punjab, U. P. and East Bengal. The level tracts afford greater facility for the exercise of economic activities and yield a larger fruit. India is mainly an agricultural country and density varies with agricultural conditions too.

To the above factors may be added a few more points as affecting the geographical distribution of population.

(a) *Rivers* affect the settlement through the water-supply, transport and floods. River valleys have since long been centres of population and civilization. The Indus and the Ganges valleys claim large populations more specially in their lower parts and in the deltas. The deltas of the rivers of the Deccan also have good numbers. The *khadar* lands or the regions liable to be affected by river floods are naturally thinly populated.

(b) *Forests* are areas of thin populations. The sundarbans and the plateau of Shillong are examples in India besides the forests of the Tarai.

(c) *Methods of cultivation* and the *crops* grown also have appreciable influence on the density of population. Intensive farming and the cultivation of wheat and good quality cotton are factors responsible for the increasing density in some of the colony districts of the Punjab.

In wet eastern India rice is the chief crop and its influence is clearly brought in Bengal, Bihar and in the eastern coastal plains as well as in C. P. where density increases along with an intensification in rice production as rice provides food for more people.

In drier parts of the country barley and jowar areas provide food for most people as their yields are higher than those of wheat. In areas of higher densities these crops are mostly grown resulting in the exclusion of wheat.

The cultivation of *cash crops* is also important from the population point of view. The farmer cannot do without them. It is, therefore, common that a high yielding *food* crop is always combined 'with a good *cash* crop' (e. g., rice and jute in Bengal, wheat and

cotton in the Punjab, wheat and sugar-cane in U. P.) in areas of high density.

(d) Security of life and property is also a factor responsible for the number of people living in an area. In the tribal areas and in certain tracts bordering on jungles, the density is comparatively lower.

(e) Inter-provincial or inter-state variations in density are also due to the stay-at-home habits of the people. People cling to their native land even though the prospects of living may be brighter in a remote province.

Density compared with Foreign Countries. If we compare the density of population in India with some other countries, there is apparently no cause for alarm as is shown by this table.

Density Per Square Mile In Some Countries

U. K.	685	} 1931
Belgium	...	...	654
Germany	...	...	352
Japan	...	...	443
British India	341	1941

But the inference is wrong, as these are industrial countries and can easily maintain heavy numbers. When, however, we compare India with countries with an agricultural economy, we feel concerned at the seriousness of the problem.

		Density.	Year.
France	...	184	} 1931
U.S.A.	...	41	
New Zealand	...	12	
Egypt	...	34	
India	...	256	1941

With such a dense population the pressure on the soil has greatly increased. The agricultural resources of the country have not expanded in proportion. Between 1921 and 1941 the population increased by 32 per cent while the cultivated area increased by 13 per cent only and the area under food crops during the same 40 years increased by 5.3 per cent only. During the war of 1939–1945 when India was cut off from Burma and Australia, India had to face a dearth of food to such a great extent that famine conditions prevailed in deficit areas like Bengal. India again faces an acute shortage of food this year.

It would appear that so far as density is concerned we are in the company of rich and prosperous countries like U. K. Belgium, Germany and Japan. Like them we show a very high density of population per square mile. To a superficial observer there might seem some essential connection between high density and prosperity. It may be argued that if a country contains a large number of intelligent, industrious and resourceful people, they will certainly develop and work the resources of the country to its best advantage and con-

tribute to its material prosperity. The argument seems plausible. But it is fallacious. If a country is densely populated it does not necessarily follow that it must be prosperous. Density does not indicate the level of economic prosperity. The United States, admittedly the richest country in the world, have got a very low density of 41 persons per square mile, and though the New Zealanders are fairly rich, yet the density there is as low as 12. Then again, U.K., with the highest density and U.S.A. with very low density enjoy nearly the same standard of prosperity. The fact is that there is no necessary connection between density and prosperity. Of the agricultural countries we have the highest density. But far from indicating a large measure of prosperity and being a matter for congratulations, it is a cause for alarm.

Population Zones. A study of the population map of India shows that roughly the Zone of spare population (Below 100) includes :—

(a) The dry, desert regions of Rajputana and Sind. The Sukkur Barrage in Sindh and the Ganga Canal in Bikaner have, however, improved things in the relevant regions. The average density is below 25 and there are places where it is even less than 10.

(b) The hilly regions of the north, north-east and north-west also fall in the same category. Population decreases with altitude and there are no people living above about 14,000 feet.

(c) The arid regions of the Chotta Nagpur plateau, Bastor and Orissa are also regions of low density. In the mineral belt of Chotta Nagpur and Orissa, population has grown along with the exploitation of minerals.

(d) The peninsula is as whole generally thinly populated. It is only in the coastal plains specially in the deltas in the east and round-about Bombay in the west that the figures go up considerably. The broken topography of the southern plateau and the forests of the new areas are the chief causes of this state of affairs.

Regions having above 100 persons per square mile may be included in the better populated zone. This is only the average; there are however places where the average density is even above 500 or even 600 e.g. in parts of Bengal and U. P. and the Punjab. The highest density is noticeable in the Indo-Gangetic plains and in the coastal plains where both the soil and the climate combine to stimulate healthy settlement.

(a) The Indus valley shows a remarkable relation between population, rainfall and irrigation. As a rule the density increases northwards with a corresponding increase in rainfall. The Punjab plains now have a flourishing population and this is in no small measure due to the great increase in irrigational facilities. The canal colonies now have a high density, whereas the density figures in pre-irrigation days were none too encouraging.

(b) The same considerations prevail in the Ganges valley where there is a rainfall cum population rise towards east and south-east. The canal and tube-well irrigated portions of U. P., however, claim exception to this rule.

(c) The southern coastal plains contain densely peopled areas specially in the river deltas and near Bombay (where the great development of industries and shipping also plays a major part) where density stands at a high level. The western plains have abundant rainfall and there are places e.g., Cochin state where density is above 750. In the eastern coastal plains, canal irrigation also helps in putting the density high.

Birth and Death Rates : India leads the world both in births and deaths. The large number of births is due to the universality of marriage and the high fertility per marriage. The people are illiterate, ignorant and superstitious. They are incapable of exercising any conscious check on the growth of their families. They are superstitious enough to hanker for children in any number, provided they are males. Their standard of living is so low that the increase in the size of the family causes little financial worry.

But if more come, more die too. The high degree of infant mortality is due to early marriages leading to child wives, ignorant motherhood, defective midwifery arrangements, insufficiency of milk supply and the practice of drugging the child. Female infanticide was also prevalent at one time. The appalling poverty and widespread and ever-recurring epidemics mercilessly cut down the numbers. The labours of motherhood go in vain.

Birth, Death and Infant mortality rates

Year	Ratio of births per 1,000	Ratio of deaths Per 1,000	Infant mortality per 1,000 births
1920	33	31	195
1921	32	31	198
1922	32	24	175
1923	34	25	176
1924	33	28	189
1925	32	24	174
1926	33	25	189
1927	33	23	167
1928	34	24	173
1929	33	24	178
1930	33	25	178
1931	35	25	179
1932	34	22	169
1933	36	23	171
1934	34	25	187

*It must be remembered that in India rainfall controls the population only through its control on poor production.

1935	35	24	164
1936	36	23	162
1937	35	22	162
1938	34	24	167
1939	34	22	156
1940	33	22	160

While the birth rate in India has been practically steady at 33, the death rate per 1,000 has fallen from 31 in 1920 to 22 in 1940. Prof. Gyan Chand, however, believes that due to the lack of reliable statistics in the villages these figures are too low and he puts them at 48 and 33 respectively* Compared with countries in the West these figures are very high and speak of the terrible waste of human life and energy in this country.

Birth and death rates for some countries in 1930 (per 1,000).

Country		Birth rate	Death rate
Holland	...	23	9
U. K.	...	17	12
Germany	...	17	11
Italy	...	27	14
France	...	18	16
India	...	33	22

Rural and Urban Population. Out of the total population of 388,997,955 some 339,301,902 live in villages (rural population) and only 49,696,053 live in towns (urban population). It means that only 12·8 per cent of the people, according to 1941 census, live in urban areas. This shows a slight increase from previous figures.†

1921—10·2 p.c.†

1931—11 p.c.

Although the percentage increase is very insignificant, the absolute growth in urbanisation has been marked. Looked at from this point of view the increase has been 81 per cent as against 15 p. c. for the whole country. The number of cities with a hundred thousand inhabitants and more has gone up from 35 in 1931 to 58 in 1941, and the population living in such cities has gone up from 9·1 to 16·5 millions. The total number of towns (*i. e.*, places having 5,000 and more inhabitants) in 1941 was 2,739 as compared to 2,480 in 1931. The following table shows the number of towns in individual provinces and states and the population of ten largest towns in India.

*Gyan Chand, India's Teeming Millions, Chapter VIII.

†This urbanisation might be due to the pressure on land and industrialisation.

‡As compared to this 50 p. c. of the population in France and 80 p. c. of the population in England and Wales, is urban.

TABLE A (*Towns*)

Madras	407	N. W. F. P.	28
Bombay	185	Sindh	26
Bengal	149	Ajmer	5
U. P.	445	Baluchistan	12
Punjab	202	Coorg	2
Bihar	88	Delhi	9
C. P. & Berar	119	States & agencies	979
Assam	30	Orissa	17

TABLE B

POPULATION OF 10 LARGEST TOWNS

Calcutta	...	...	2,109,000
Bombay	...	...	1,489,000
Madras	...	...	777,000
Hydrabad	..	...	739,000
Lahore	...	...	672,000
Ahmedabad	...	...	591,000
Delhi	...	...	522,000
Cawnpore	...	...	487,000
Amritsar	...	...	391,000
Lucknow	...	...	387,000

Now let us turn to rural population that forms more than of the total-83 p. c. to be exact. In the whole of the country are about 655,892 villages with less than 5,000 persons. More than 500,000 villages contain population below 1,000 or even 500 persons. The following table shows the number of villages in individual provinces and states.

Madras	35,430	N. W. F. P.	2,826
Bombay	21,472	Sindh	6,582
Bengal	84,213	Ajmer	706
U. P.	102,388	Baluchistan	1,637
Punjab	35,269	Coorg	301
Bihar	68,869	Delhi	305
C. P. & Berar	38,985	States & agencies	196,501
Assam	33,560	Orissa	26,653

It will be seen from a study of the above table that about 50 per cent of the villages (and also the rural population) lie in the Indus and the Ganges valley—the Ganges valley being more important. The largest number of villages is found in U. P. The area shared by individual villages is naturally smallest in the Ganges valley—less than one square mile in Bengal and about four square miles in the Bombay Presidency specially in Coorg. In N. W. F. P. too it is about the same. The following table gives the average area of a village in some Indian provinces.

Madras	...	2.7 sq. miles
Bombay	...	4.3 „
Bengal	...	.8 „
U. P.	...	1.1 „
Punjab	...	2.3 „
Bihar & Orissa	...	.9 „
C. P.	...	2.6 „
Coorg	...	4.6 „
Delhi	...	1.8 „

***Village types.** The Indian villages may be classified as† :—

- (1) The scattered Homestead (Malabar, Bengal and Assam).
- (2) Large compact villages (whole India).
- (3) The hamlet or a collection of separate huts (not very important).

In determining the village type, the problem of water-supply is the most marked. Other determining factors are (1) land forms, (2) soil, (3) climate, (4) vegetation. Conditions of security, the current agrarian system, social, racial and religious ideas also play some part. Whenever the water-supply is plentiful, type No. 1 is the rule; while in places of limited water-supply as in the Punjab and western U. P., type No. 2 is more common. In areas of well-water concentration of people and compact settlements have resulted. In areas of heavy rainfall, there is no need for compactness of settlements. This is more prominent in Bengal and in Malabar and Travancore. In the peninsula compact settlements have to exist around tanks. In canal colonies of the Punjab and in the canal areas of U. P., regularly spaced settlements have grown up.

Agriculture, land-tenure and communications are other factors that determine the village patterns in India.

The agricultural unit in India is very small and compact villages are the natural result.

Except in Bengal and Assam, there is no permanent settlement of land tenure in the country and periodic revision has to be carried on. It is, therefore, only natural that except in Assam and Bengal, compact settlements have to be maintained for the purpose.

*We are indebted to "Environment and Distribution of Population." (By Dr. K. S. Ahmad—Indian Geographical Journal Vol. XVI No. 2, 1941) for information regarding this topic.

†The same as recognised in Europe.

In mountain and forest areas, people huddle close to railways and roads. In areas with cheap and abundant transport facilities, there is no such tendency in evidence.

Distribution according to occupations. About 67 per cent of the total population* are engaged in agriculture and allied industries; 10 per cent in mining and industries, about 7 per cent in trade and transport, thus leaving about 16 percent under others. This may be compared with some other countries :—

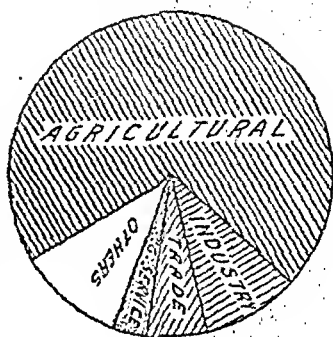


Fig. 62.

	Agriculture etc.	Mining and Industry	Trade and Transport	Others
Great Britain	7.1	47.2	20.7	25
U. S. A.	22.0	31.7	24.5	21.8
Japan	50.3	19.5	20.2	10.0

One is struck by the most uneven distribution of our people over the various occupations. It simply reflects the lop-sided nature of our resources. If the economic development of the country had taken place in a sufficiently diversified manner our human resources would have shown a more balanced allocation.

Although 10 per cent are shown as being engaged in industry, only 1.5 per cent are accounted for by organised industry. When we know that less than one-fifth of our people are engaged in trade, transport and industry, we find a clue to Indian poverty. These are the most paying professions, and when the bulk of our people drift into unremunerative channels, poverty is inescapable. *Industrialise or perish*, should be our slogan. No amount of agricultural rehabilitation can pull us out of the mire of poverty.

The most distressing fact about our vocational distribution is that the overwhelmingly large number of the people are dependent on agriculture. Even Bengal, Bihar and Orissa, in spite of having developed certain industries, are predominantly agricultural and so are the Punjab and U. P. although a very large proportion of their population is returned as industrial labour. India shows the highest percentage of people in the world as depending on agriculture.

Agriculture is admittedly the least remunerative of occupations. Experience all over the world has shown that economic progress has always been marked by a diminution in the numbers engaged in agriculture and by an increase in those engaged in trade transport and industry. In England less than 10 per cent of the people depend on agriculture. Indian agriculture is a gamble in the rains

*44 p. c. of the total or 171 million is the working population.

and, therefore, always uncertain of success. It is subject to the law of diminishing returns. It is a seasonal occupation and subjects our people to enforced idleness for several months in the year. Exclusive dependence on agriculture is an index of unbalanced economy and is one of the most important causes of poverty. This situation needs immediate rectification. As long ago as 1880 the Famine Commission issued a warning about the dangers of this situation.

It may be noticed that from census to census the vocational distribution has remained practically the same. There has been no fundamental change in this respect during the last 25 years or so. A slight increase is observable in the number of persons engaged in transport which is due to the development of motor traffic and also in those engaged in liberal professions which may be attributed to advance in literacy. It is time that we made conscious and vigorous efforts to bring about a more even distribution of the people over the various occupations and overcome this economic stagnation.

Movement of population. (a) Within India :—

Within India, movement is small, but it plays an important part in the economy of certain areas. Internal migration is of five kinds.

(i) Casual, between neighbouring villages to visit relations or on casual business.

(ii) Temporary, to visit fairs, to work as coolies, to visit places of religious worship, etc.

(iii) Periodic or seasonal, to reap harvests, to graze sheep on the higher ranges of mountains in the summer, etc.

(iv) Semi-permanent, to earn a livelihood at distant places always with the idea of coming back e.g., to labour in factories in Bombay and Calcutta or to serve as domestic servants in the cities.

(v) Permanent, e.g., to settle in the canal colonies in the Punjab.

The tea gardens in Assam import all their labour from Bihar, Madras and C. P. while the fertile lands in the Brahmaputra valley have attracted settlers from Mymensingh and East Bengal. The tea-estate labour in Assam is now secured under fixed conditions and is well looked after.

The Bengali is as a rule averse to work in the mines. Hence most of the industrial work in Bengal is done by immigrants from Nepal, Bihar, Orissa and the East U. P.

Labour Immigrants in Bengal

Bihar and Orissa	... 60 p. c.
U. P.	... 18 "
Nepal	... 5 "
C. P.	... 3 "
Others	... 14 "

Bombay too gets most of its industrial labour from outside. The Punjab, U. P., and N. W. F. P. on one side, and Hyderabad and Madras on the other are the major contributors.

The stalwart Punjabi is ubiquitous and is found almost everywhere working as a technician, a taxi-driver or a policeman.

(b) Indians Abroad:—

Emigration plays an insignificant part in the movements of Indian population. She has ordinarily no more than about three million people resident in other parts of the British Empire and only about 100,000 in foreign countries like Dutch East Indies, Dutch Guiana, Madagascar, U. S. A., etc. Ceylon, Burma and Malaya have as many as two millions out of the three in the British Empire.

The following table gives the number of Indians in some parts of the empire.

Ceylon	...	7,00,000
Br. Malaya	...	6,00,000
Canada	...	1,20,000
Trinidad	...	1,50,000
Jamaica	...	18,000

Most of the emigrants from India are manual workers. The rest are either business men or artisans who have voluntarily gone out to improve their lot. In spite of the great increase in population in the last decade emigration has not served to relieve pressure. One reason why the Indian does not go out in large numbers is that he is not tolerated abroad. The recent Pegging Legislation in South Africa is a case in point. The standard of living in the Dominions is higher than that of the Indian immigrants, hence the restrictions on their entry and the segregation of those already settled. This is most unfair. There are many parts of the British Empire in the tropics like British Guiana and Africa where the density of population is low and which are peculiarly suited to Indians. Schemes of emigration from India to such places could be taken in hand with success and the pressure at home relieved.

B. A STUDY OF RACES, RELIGIONS AND LANGUAGES.

1. The races of India. At a very early stage, the only people living in India were very wild and uncivilized people referred to as the pre-Dravidians. Then, they were replaced by a more advanced racial group known as the Dravidians. They were dark skinned people of short stature, with black hair and eyes, and broad noses. They spread all over India and drove the wild inhabitants away to the hills and the thick forests. This group is a branch of one of the really big racial groups of the world.

The earliest invaders, who entered the country from the north-west and settled there, were the Aryans. They were tall, light skinned people with fine straight noses. Being physically stronger,

POPULATION

they took possession of the best lands, such as the fertile Northern India and drove the earlier inhabitants into the Pe India, South of the Satpura line.

Later on, through the northern and eastern river valleys came the Mongols—people with dark yellow skins and flat faces, and

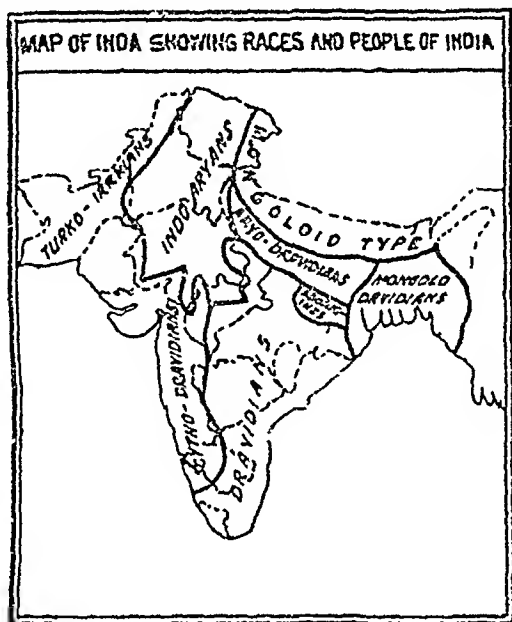


Fig. 63

settled in the northern and eastern outskirts of the country. Then people of various other races, for example, Scythians, Iranians and Turks entered the country from time to time often inter-marrying with the people they had conquered. As a result of this mixture the following races have been traced by Sir Herbert Risley (1891).

1. Dravidians, in Madras, C.P., and Central India.
2. The Mongoloids in the Himalayas, Nepal and Assam.
3. Mongolo-Dravidians, in Bengal and Orissa.
4. The Arya-Dravidians, in Southern and Eastern U.P., Bihar and Eastern part of Rajputana.
5. The Scytho-Dravidians, in Maharastra and Malabar.
6. The Indo-Aryans, in the Punjab, Kashmir, U. P. and Rajputana.
7. The Turko-Iranians, in Baluchistan, and N. W. Frontier Provinces.
8. The Aborigines of Chota Nagpur Plateau.

Bombay the census of 1931, Mr. B. S. Guha carried out a systematic anthropological survey of the peoples of India and to some Madras, revised Risley's earlier results. His racial groups come from main races with nine sub-types.

1. The Negrito.
2. The Proto-Australoid.
3. The Mongoloid :—
 - (a) Palae-Mongoloids.
 - (1) long-headed ; (2) broad-headed.
 - (b) Tibeto-Mongoloids.
4. The Mediteranean :—
 - (a) Palae-Mediterranean.
 - (b) Mediterranean.
 - (c) Oriental.
5. The Western Brachycephals :—
 - (a) Alpinoid.
 - (b) Dinaric.
 - (c) Armenoid.
6. The Nordic.

The first list is more or less universally accepted.

2. The Religious Pattern.* In India the lives of the people are controlled by the dictates of their religion. In fact, it controls their whole social environment such as education, customs and habits, occupations, marriage, dwelling place, type of home and architecture of towns. These religions originated from different races, who, in course of time, developed different beliefs and class distinctions based on colour, localities, intermixture of blood and the intervals at which foreigners entered the country from time to time.

The largest religious group is the Hindus, whose 'Caste' system has become so rigid that in itself it has proved a handicap for unity.

Next in importance are the Mohammedans, who are found mainly in the north-west and north-east. Unfortunately, there is a great amount of bitterness between these two groups of Hindus and Muslims.

Jains, Christians, Sikhs and Tribes form some of the minorities. The following tables give the figures for these communities, as well as their per centage ratio.

TABLE A

Population by communities

Hindus—255 millions (including 49 millions scheduled castes).
Moslems—94½ millions.
Christians—7¼ millions (including 140,000 Anglo-Indians and 135,000 Europeans).

*For a rich and frank account see "The Communal Pattern of India" by Dr. K. S. Ahmad—1945.

Sikhs—5½ millions.
 Jains—1½ „
 Buddhists—232,000.
 Parsees—115,000.
 Jews—22,000.
 Tribes—25 millions.

TABLE B.

Per Centage of Communities

Hindus	65.9	p.c. of the population.		
Moslems	23.8	„	„	„
Christians	1.6	„	„	„
Jains	.4	„	„	„
Sikhs	1.5	„	„	„
Tribes	6.6	„	„	„
Others	.2	„	„	„

The Hindus and Moslems we as a matter of fact found living together all over, but the Muslims constitute a majority in Bengal, Punjab, N. W. F. P. and Sindh.

It is in these regions where some sections of the Muslim community want to establish Muslim rule or 'Pakistan'. While the caste system is a very prominent feature of Hinduism, Islam does not recognise caste and creed and aims at the formation of a class-

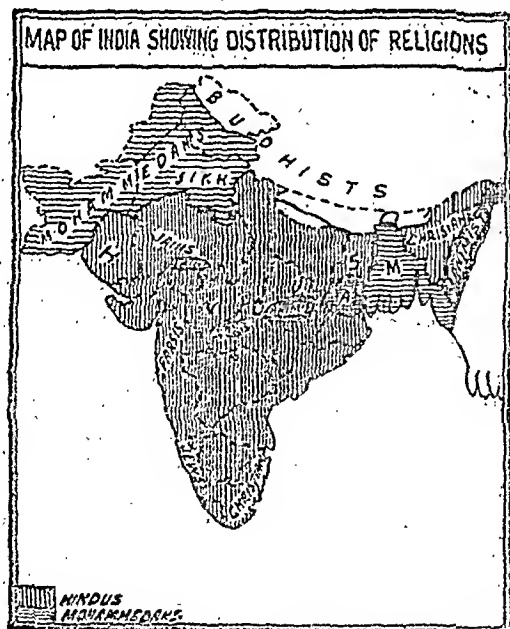


Fig. 64.

less society. During recent years political differences have become so deep that both Hindus and Muslims have begun to believe that they are two different nations, as Mr. Savarkar President of the Hindu Mahasabha admits: "India cannot be assumed today to be a unitarian and homogeneous nation, but on the contrary there are two nations, in the main, the Hindus and the Muslims."

The *Scheduled Castes* number about 40 millions or near about 14 p. c. of the total British Indian population. They are specially numerous in —

U. P.	20 p. c.
C. P. and Berar	18 p. c.
Madras	16 p. c.
Orissa	14 p. c.
Bengal	12 p. c.
Bihar	10 p. c.

These people are supposed to be of the lower order both socially and culturally and were meant by the caste-makers for the cleaning and other dirty work of the higher castes. Both Hindus and Moslems regard them as low. Mahatma Gandhi has taken the welcome step of bettering their lot. He calls them as 'Harijans' or the 'sons of God'. Now the puzzling question is whether they are a part of Hindus or they constitute a separate unit. In the Punjab some 400,000 persons declared themselves as 'adhmis' in 1931 and 1941 census. But the fact remains that they constitute an important minority in all the provinces. "The distribution of Scheduled Castes shows a widely scattered pattern" in the country.

The *Tribes* have a total of about 17 million or about 7 p.c. of the total population. Their largest concentrations are found in Assam (24 p.c.), Orissa (21 p.c.), Bihar (18 p.c.) and C. P. and Berar (18 p. c.). In Andamans and Nicobar they are about 40 p. c. of the population. They constitute compact groups and live an entirely primitive life. Their abodes are usually in the hills and the forests of the country. Most of them are animists but some believe in Hinduism, Islam, Buddhism as well as in Christianity.

Sikhs are found mostly in the Punjab* where their number is about 3·76 millions or 90 p. c. of their total in the country. In the Punjab they constitute 13 p. c. of the total population. Socially Sikhs are a part of the great Hindu organisation as their mode of living, habits etc. are similar. There is also no bar for inter-marriages amongst Hindus and Sikhs. Sikhism as a religion, however, "seeks a synthesis of the monotheism of Islam and the philosophical thought of Hinduism."

Christianity claims about 8 million persons within its folds—more than 1 per cent. of the total population. They are very numerous in Madras† which province claims about 60 per cent. of

*Specially in the Ghaggar Plain—Ambala and Jullundur Divisions.

†Mostly in Gunther and Tinnevely where they claim 10 per cent of the population, their number is 1,060,957.

the total. Elsewhere they are very few in number and live mostly in urban areas.

Jains, Parsis and Buddhists constitute small groups. Jains are particularly concentrated in Rajputana, Parsis in Bombay and Buddhists in Nepal and Lhutan. But everywhere their number is too small to claim any recognition as a separate unit.

The following table gives communal populations in the various provinces and warrants careful study specially in the 'Communal India' of today.

Province	Hindus*	Scheduled castes	Muslims.	Other Principal minorities
1. United Provinces	34,094,511	11,717,158	8,416,398	289,422 (Tribes)
2. Punjab	6,301,737	1,592,320	16,217,742	3,757,401 (Sikhs)
3. N.-W.F.P.	197,831		2,810,865	62,411 (Sikhs)
4. Bihar	22,173,890	4,340,379	4,716,314	5,055,617 (Tribes)
5. Orissa	5,594,535	1,238,171	146,301	1,721,093 (Tribes)
6. Bengal	17,680,054	7,378,970	33,005,431	1,889,389 (Tribes)
7. Assam	3,535,932	676,291	3,412,479	2,484,995 (Tribes)
8. Madras	34,731,330	8,068,492	3,896,451	2,091,082 (Indian Christians)
9. Bombay	14,700,242	1,855,148	1,920,368	1,614,798 (Tribes)
10. Sind	1,038,292	191,634	3,208,325	31,011 (Sikhs)
11. C. P. & Berar	9,880,583	3,051,413	783,697	2,937,354 (Tribes)
12. Baluchistan	39,521	5,102	438,930	11,918 (Sikhs)
13. Delhi	444,532	122,693	304,971	16,157 (Sikhs)
14. Ajmer-Merwara	376,481		89,899	91,472 (Tribes)
15. Coorg	105,013	25,740	14,730	19,723 (Tribes)

3. Languages. *The Linguistic Survey of India* enumerated some 179 languages and 514 dialects in the country. But there are

*Excluding Scheduled Castes.

only 15 major or literary languages*, 11 belonging to the Aryan and 4 to the Dravidian group. The pre-historic Austric languages also survive in some remote areas. The linguistic complexity of India is based on the racial complexity. For instance in the north and north-west Indo-European languages are prevalent, while in the north-east languages belong to the Tibeto-Chinese family. The main languages of India are:

A. Aryan 1. High-Hindi.

2. Urdu or Persianised Hindi or Hindustani.
3. Bengali spoken in Bengal.
4. Oriya spoken in Orissa.
5. Marathi spoken in South Bombay and Eastern C. P.
6. Gujrati spoken in Gujrat Kathiawar and North Bombay.
7. Sindhi spoken in Sindh.
8. Kashmiri and Pahari spoken in Kashmir and Himalayan slopes.
9. Punjabi spoken in Punjab.
10. Nepali.
11. Assamese spoken in Assam.

B. Dravidian. (South India specially Madras.)

12. Telugu.
13. Kannada.
14. Tamil.
15. Malavalam.

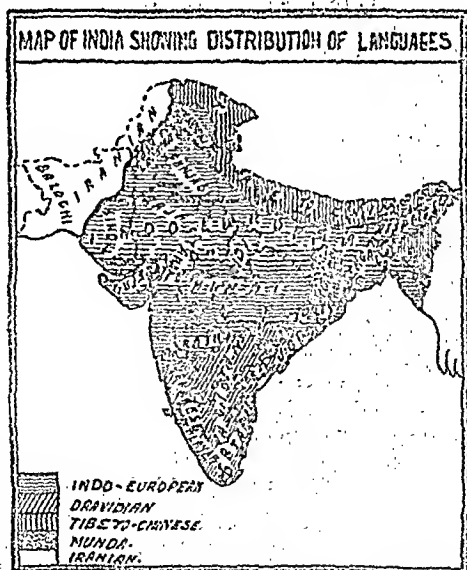


Fig. 65.

*Even this could be reduced to 12 if we take note of very close affinity among some of them.

Rajasthani a modified form of Hindi is prevalent in Rajputana. Tulu is spoken in North Travancore. Karen, Chins, Malay and Kachin are spoken by the hill tribes of the Himalayas.

It should be stressed that Hindustani or Hindi is spoken and understood by nearly all the people speaking the Aryan languages. It is even understood in most of the peninsula.

Pre-Dravidian or Austric languages are (1) Munda or Kol group, (2) Khasi and (3) Nicobarese. All of these belong to the tribes and the total of people speaking them does not exceed five million in all.

English is also an important language used mostly by the educated classes all-over. The per centage of English-knowing persons is highest in Bombay and Madras.

This complex linguistic pattern of India brings forth the need for a common language or *Lingua Franca* for the entire country. The usual prescription is simple Hindustani in Roman script or it could be simple English. The question is yet to be decided. And after all the problem is not of any urgent importance as with simple English, and Bazar Hindustani, our all-India affairs are going on unhindered. Looking at the vast size and the huge population of the country, the linguistic problem as it is today, is not so very despairing and no remedy is needed forthwith.

Literacy in India. For census purposes literacy has been defined as "the ability to write a letter and read the answer to it." Although in recent years there has been a vast increase in literacy figures, the matters stand at a very low level when compared with other countries. In 1941, out of every 1000 persons 121 persons were literate as compared to 46 out of every thousand in 1881. The following table shows the number of literates per 1000 in some of the provinces and Indian states (1941).

Bengal	161	U. P.	84.
Bombay	195	Bihar and Orissa	95.
Madras	130	N. W. F. P.	79.
Assam	113	Cochin	354.
C. P.	114	Travancore	477.
Punjab	129	Baroda	229.

The decade 1931—41 shows a good increase in literacy per centage—6·9 in 1931 and 12·2 in 1941—and it is hoped that with the new plans in operation in the various parts of the country, the figures in the next census will show a very marked increase.

Parsis are the most literate community, then come Jews and Jains and Sikhs. The major communities *i.e.*, Hindus and Muslims are equally very low. The following table shows the literacy per 1000, aged five and over in different communities according to 1931 census.

Parsis	791
Jews	416
Jains	353
Christians	279
Sikhs	91
Hindus	84
Muslims	64

Literacy in women is as yet at a very low level in India. Only 23 women out of every 1000 are literate, a figure which is disgracefully low and yet this figure shows an increase of about 150 per cent over that of the previous census.

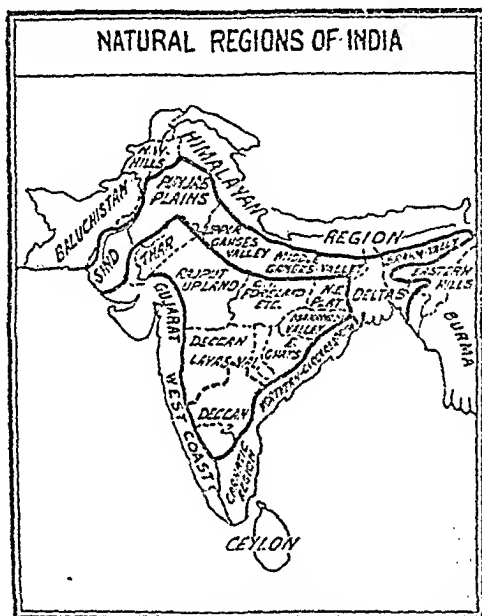
Literacy in English, likewise is also quite low, lower in women. In 1931 out of every 1,000 persons, only 123 were literate in English (males 212, women 27).

We should aim at complete liquidation of illiteracy at an early date. Russia did this in 19 years, why can't we?

NATURAL REGIONS

NATURAL REGIONS OF INDIA

In all about five or six attempts have been made to divide India into natural regions. Out of these only two i.e., by M. B. Pithawala and Kazi Saeed-ud-din Ahmad, are by Indians. The census regions devised by the census department are not so very useful from the geographers' point of view. The universally accepted scheme is that evolved by Dudley Stamp in 1922-24 and used in his 'Asia' and in the 'Regional Geographies of India'. We have,



(After Stamp)

Fig. 66

therefore, used the same scheme here. The account of each region has been summarised from Stamp's 'Asia' (Methuen and Co.) for which we tender our thanks.

India has been physiographically divided into three regions i.e.,

1. The Mountain Wall of the North.
2. The Northern or the Hindustan plains.
3. The Indian Plateau.

These could be further sub-divided according to climate and the same have been found useful as natural regions. This means that the natural regions of India are :

1. The natural regions of the *mountain wall*.
2. The natural regions of the *Hindustan Plains*.
3. The natural regions of the *Indian Plateau*.

We have, however, changed the order of these regions and give them according to their human importance thus :—

1. The regions of the Hindustan Plains.
2. The regions of the Indian Peninsula.
3. The regions of the Mountain Wall.

1. The Hindustan Plains.

It is further divided into the following regions.

(a) Lower Indus Valley. (b) The Punjab Plains. (c) Upper Ganges Plain. (d) Middle Ganges Plain. (e) Lower Ganges Plain. (f) Brahmaputra Valley.

(a) Lower Indus Valley. This region *i.e.*, Sindh became a separate province after 1937. Rainfall here is scanty, below 4". It is called the *unhappy valley*, because the invaders who came to India were unhappy at finding it a dry region contrary to their expectations. On the other hand it is called the *gifts of the Indus*. Irrigation is done by canals and agriculture is strictly restricted to the areas near the river and the canals. The interior is dry because of two reasons, (1) dry soil that soaks water and (2) limited supply of river water. Indus delta, too, is dry, only here and there some pastures are to be seen. Due to the lack of rainfall only about 16% of the whole area is cultivated and 3/4th of this 16% is irrigated by canals. The chief crop is millet and occupies about 34% of the area cultivated. Rice has been introduced only recently and occupies 23% of the area, wheat occupies 12%, cotton 7%, oil seeds 6%. On the whole population is thin and is concentrated in the irrigated areas. Cities are few. Karachi, which is also the capital, is the only important port.

(b) The Punjab plains mainly consist of the valleys of the 5 rivers and the small province of Delhi. The doabs are characterised by their flatness and by the continuous deposits of alluvium. At places near about the rivers one comes across very young soils called *khadar*. It is on account of this characteristic of the soil that it is easy to dig canals. There are places near the Chenab and Jhelum which are high and where it is difficult for the canals to reach, with the result that this doab (Sagar Doab) has practically no irrigational facilities.

The areas lying near about the hills are subjected to earthquakes which are caused due to the land movements in the Himalayan mountains. To the south of the river Sutlej the land gradually begins to rise and gets drier and drier till it merges into the Thar desert. Taking on the whole the climate of these plains is extreme. Winter temperatures come down to about 55°F while the summer temperatures rise to 90°F and above. Frost is also frequent in the winters.

The *bangar* portions of the plains have good deposits of *kankar* which is used for the construction of roads.

Rainfall on the whole is low below 25" but gets very low in the S. W. portion where it is often below 5". Towards the north and east there is a gradual increase. The northern portions also get cyclonic rains during winters which are very helpful for winter crops. Climatically we could further divide the region into 3 divisions.

(1) N.-E. portion. This is the wettest portion and receives 20"—30". Sub-soil water level is high and wells are used for irrigation.

(2) S.-W. portion is the driest area (5"—10"). Agriculture is impossible without irrigation. Wherever irrigation facilities do not exist semi-desert conditions are found.

(3) S.-E. portion receives about 20" but the average is subjected to great annual variations and therefore irrigation is also needed as stand by.

About 57 % of the total area is under cultivation and out of this about 60% or about 13 million acres are irrigated. The greatest share in irrigation is claimed by S.-W. portion and the lowest by N.-East. As stated before the Sagar Doab, because of its rising topography, is bereft of irrigation.

Wheat is the most important crop and occupies between $\frac{1}{2}$ and $\frac{2}{3}$ of the total cultivated area and contributes 35% of the total crop production. Millets contribute 12%, rice 3%, barley 4%, cotton 8%, and fodder 15%. The high percentage of fodder is due to the absence of natural food for cattle which are used in large numbers for cultivation and transport purposes. Cotton is important for its quality. This is the only province in India where American cotton is successfully cultivated.

Population on the whole is fairly dense and about 65% of the people are actually farmers while only 13% live in towns. The rest are also rural and follow cottage industries especially handloom weaving. This particular industry claims $\frac{1}{2}$ of industrial workers.

(c) Upper Ganges Plain begins roughly from the east of Delhi and goes on upto Allahabad. It includes a very important geographical area—Ganges Jamna Doab. It differs from the Punjab plains mainly in the amount of rainfall received which is between 30"—40". There is however a general decrease towards west and an increase towards east and north. Irrigation is very important especially for the winter crops and the sugar-cane cultivation. In the years of scarcity of rainfall irrigation comes to the help of the farmer. In average years about 36% of the total area cropped including the double cropped area, is irrigated. The doab claims most of the irrigational works and the district of Meerut is the most irrigated district in the whole of Ganges plain. About 57% of the agricultural land is irrigated.

Taking the region as a whole about 70% of the total area is under the plough. Double cropping with intervening cash crops is followed. Wheat and barley are leading winter crops. Rice is cultivated in the wetter districts. The area is very famous for sugar-cane cultivation and sugar industry. Millets and pulses predominate in less fertile and drier districts. Cotton is an important cash crop. The density of population is very thick. About 88% of the people live in localities having less than 5000 inhabitants. Cawnpur, Hathras and Agra are important industrial towns famous for their cotton mills. Leather goods are important in Cawnpur. Agra is important for its stone industry also.

(d) The Middle Ganges plain includes nearly the whole of Bihar lying north of Ganges, portions of Patna, Gaya, Shahabad districts lying immediately south of the river and a small portion of U.P. lying east of Allahabad and north of Ganges. This region is transitory between the wet lower Ganges Valley and comparatively drier upper Ganges Valley. Rainfall varies from 40" in the west to 70" in the east and north. Temperatures are less extreme than in the Punjab or Upper Ganges plain. In January the average lowest temperature never goes below 60°F. In June the average maximum temperature never goes above 85°. Irrigation is not a necessity and hence not so very important but some facilities exist for years of special scarcity. It is only in a very small strip to the south of the Ganges that river Son and other streams are used for irrigation regularly, as this area is comparatively drier.

The main work of the rivers here is of deposition because of the very slow speed with the result that the river beds are gradually rising up and the water level in the rivers is higher and very often the rivers overflow their banks and cause flood. Originally this area was associated with shallow lakes and marshes. They represented old deserted river beds or low lying areas between them but at present most of the marshes have been drained and now about 75% of the area is cultivated.

With the increase in rainfall rice gains importance and wheat and barley go down. Millets completely disappear and cotton also loses importance. Sugar cane and oil-seeds are other important crops. Formerly this region was important for indigo and opium but now both of the commodities have lost much of their importance. The area is very densely populated and the birthrate is high with consequent emigration to the tea gardens of Assam and to the factories and docks of Calcutta. Benaras, Patna, Munghyr, and Mirzapur are the important towns. Benaras is very important for its silk and brass industries and Mirzapur is important for its lac industry.

(e) The Lower Ganges plain corresponds roughly with the presidency of Bengal and consists entirely of an alluvial plain portions of which are being renewed yearly by the channels of the Ganges-Burhamaputra river system. In the north, portions of Tarai, locally known as

duars are also included in this region. The Surma Valley of Assam is also included. The region taken as a whole is characterized by heavy rainfall which is every-where above 60". There is however a westward decrease—Sylhet 100", Dacca 73" and Calcutta 60". The region claims only a small percentage of agricultural land as nearly half of the area is covered with swamps, marshes and forests (Sunderbans and Madhopur). Only about 50% of the area could be claimed as available. But the net area cultivated is much lower. Rice is the most important crop and occupies 3/4th of the total area cultivated. Jute is another speciality of this region. Oil seeds are also quite important. The population is mostly rural and about 75% of the people are rural. The area could be further sub-divided into 3 sections : (1) The Ganges Burhamaputra doab ; (2) The old delta or the west central Bengal. This region contains the important coal-fields of Rani Gunj, Jharia and Asansol in the extreme west ; (3) the New Delta.

(f) The Assam or Barhamaputra valley occupies the middle course of the Barhamaputra river and is surrounded on all the sides by mountains. This is a small region 500 miles long and about 50 miles broad. Geologically and physically it is more or less similar to the alluvial plains of the Ganges. The areas lying immediately near the river banks are marshy and unsuitable for agricultural purposes. But places lying away have important rice fields. The gentle slopes of the hills are covered with tea gardens. Taking as a whole the rainfall is about 80". But the portions lying in the centre are somewhat dry. Winter fogs are common. The temperature conditions are a bit different from the delta region and taken as a whole the climate is somewhat colder. But cloudy skies tend to temper the heat of the summer season. The atmosphere during the summers is very sticky. Only about 10% of the area is cultivated but there is a large per centage awaiting development. The density of population is about 150 persons to a sq. mile. There is a tendency for the population to concentrate in the western areas adjoining Bengal. About 38% of the population is Assamese and the rest comprises of the Beharis and Nepalis working in the tea gardens and the Bengalis working in the paddy fields. The paddy fields could be extended into the plains if the drainage could be improved. At the eastern end of the valley there are two small oil fields of which Digboie is noted. Near the oil fields there is also a small coal field but it has not yet gained importance. The Barhamaputra river is much used for boat traffic.

2. The Indian Peninsula is broadly divided into (a) Coastal Region, (b) The Plateau, (c) Central India. The natural regions, therefore, are :—

(a) The Coastal Region :

1. Cutch, Kathiawar and Gujrat.
2. The West Coast Region.
3. The Carnatic or Tamil Region.
4. The Northern Circars region.

(b) The Plateau.

5. The Deccan Region.
6. The Deccan Lavas.
7. The North-east Plateau.

(c) Central India *i.e.*, north of Satpura Line.

8. The Central India Foreland.
9. The Rajput upland Region.
10. The Thar or the Great Indian Desert.

1. Cutch, Kathiawar and Gujarat lie between the dry Indus valley (and the Thar desert) and the humid west coast region. It is a low level area with occasional hills of varying sizes.

Cutch is actually a part of the Thar desert that lies to the north and is almost dry and treeless, and hence useless for man. Kathiawar too suffers from a precarious rainfall. The Gil forests lie in the centre of the region and yield some timber. It is only here and there that one comes across some favoured spots otherwise the country is quite barren. Some cotton is cultivated in Dhan. Wheat grows with irrigation. A type of limestone known as *Porbandar stone* is found along the coast.

Gujarat is divided into northern, central and southern Gujarat according to the amount of rainfall received. Southern Gujarat is the wettest, while the rainfall decreases in the central and the northern parts of the country. Southern Gujarat has a strip of black cotton soil where cotton and rice are grown and the population is also quite large. Further inland there are forests and thick jungle. These wild areas have a number of primitive tribes. In central Gujarat rice is grown on the river banks, millets and cotton being more important elsewhere. The population in this part is denser. Northern Gujarat is as a whole a region of poor soils and dry climate. Millets are grown in regions of better soils. Tank irrigation is important.

The main line of B.B. & C.I. Rly. runs through Gujarat and touches Surat, Baroda and Ahmedabad all connected with cotton growing or cotton manufacturing areas. Ahmedabad with a population of 591,000 is a very important centre for cotton mills, second only to Bombay. Baroda is the capital of Baroda State and also has a number of cotton mills. Daman and Cambay are also important as cotton centres.

2. The West Coast region lies between the crest of the western ghats and the Arabian Sea and comprises of a narrow coastal plain and the western slopes of the western ghats. The Portuguese territory of Goa divides the region into two, the northern and the southern part lying respectively in Bombay and Madras Presidency. Except to north of Bombay rainfall is everywhere over 80". The dry season, however, becomes longer as one moves northwards away from the almost equatorial conditions of Travancore. Both the regions have many streams that flow down from the ghats and have even formed their alluvial fans, while sand-dunes have been piled up by the waves that beat against the shore during the South-West Monsoon.

The northern strip is narrow, about 30-40 miles wide. But in spite of its narrowness three parallel strips may be distinguished. 1. The slopes of the western ghats. 2. The flat alluvial lands. 3. The shores abounding in sand-dunes and lagoons. The slopes of the western ghats are in their outer surfaces, covered by Deccan lavas and on account of the high rainfall they are clothed with luxuriant forests in which teak is important; and consequently teak industry is of some significance. The short and swift streams besides being used for transporting timber, have also been harnessed for supplying power to the mills in Bombay. The southern portions of the ghats in this region are almost uninterrupted except for the two fairly important passes which have done much to determine the importance of Bombay.

The flat alluvial lands are the most important areas in this region. The shores are largely covered with marshy tracts of mangrove swamps. One also meets a good number of cocoanut palms. The region is densely populated, the minimum density being 200 persons.

The southern region is broader and is characterized by high annual rainfall and higher uniform temperatures, the annual range being very small. In the south there are some rubber plantations. The number and size of the lagoons here is much larger and most of these lagoons have been connected by canals and so it is possible to travel the entire region by these waterways. Cochin which is situated on a high lagoon has now been turned into a modern harbour.

About 46% of the western coast is under cultivation, 28% is covered with forests and 31% is either waste or not available. Rice occupies the first position amongst crops (50%). Cocoanuts are also important (6%).

3. Carnatic or Tamil Region. Geographically it is the southern portion of the east coast but as Tamil is the chief language spoken it is referred to as the Tamil region. The region may be readily divided into two topographical features: (1) the coastal plains that consist of a broad stretch of flat land, and (2) the hilly western part that consists of hills composed of crystalline rocks. In the matter of rainfall the region differs from the whole country as it receives its maximum during October-December. The average annual rainfall is 40" in the coastal plains and gets lower as we go towards the west. The region has a bigger annual range of temperature than the western coast (Madras 15°F). Local variations of rainfall are great and irrigation is a necessity for safe cultivation. In spite of the thousands of irrigation tanks it has been a great famine area. The modern canal irrigation works have done much to mitigate the famine menace. About 63½% of the land is under cultivation in the coastal region and about 45% in the western hilly tracts. In the coastal region rice is the most important crop and covers about 40% of the cropped area. Next in importance are millet and raggi covering together 57% of the area. The area is very densely populated—400 persons per square mile. In Tangor density is 1694.

4. The Northern Circars and Orissa region comprise of the northern half of the east coast and includes the district of Vizaga-

patam, Godavari, Kistna. and Guntur and the province of Orissa as well as the district of Ganjam. The delta regions of the Godavari, Kistna and Cauvery are the best regions of the area ; while as we go westwards we come across small hills and patches of crystalline rocks. A number of minerals are born from these crystalline rocks specially manganese near Vizagapatam; winning of salt is important in Orissa. The rainfall is not heavy here and it decreases from Orissa southwards.

In Orissa the rainfall is higher and rice is the main crop. As we go southwards millets get more important with the decrease in rainfall. In the deltas of Godavari and Kistna canal irrigation facilitates rice cultivation. The hill slopes are forested.

The density of population in the region as a whole is high. Railway transport is also quite developed and the area is directly connected with Calcutta and Madras.

Vizagapatam is the biggest town as well as the main port of Northern Circars. A modern harbour was finished here in 1933.

Cuttack and Puri are important towns of Orissa.

5. The Deccan comprises of the high southern portion of the plateau, comprising of Mysore state, the Deccan districts of Madras ; the eastern half of Hyderabad and the Dharwar district of Bombay. The average elevation of land is more than 500 ft but in the south it is more than 2,000 ft. The valleys of Kistna and the Penner constitute the better plain regions of the area.

The entire area except for a small strip on the coast lies in the rain-shadow and rainfall is on an average quite low—at places even lower than 20"

The chief attraction of the region are the gold mines in Kolar (Mysore), producing about £1,500,000 worth of gold every year.

The coastal region in the west and the slopes of the Western Ghats are covered with forests. The soils as a whole are poor and millets and raggi form the chief crops. Some cotton and rice are also grown in better regions mostly with the help of irrigation. Coffee was formerly quite an important crop of the slopes of Mysore but it has dwindled in importance.

The population is not very dense, the average being about 200 souls per square mile.

Mysore and Hyderabad (739,000) and Bangalore are the chief towns. The first two are the capitals of the states of the same name. Bangalore has a number of silk factories.

6. The Deccan Lavas region, also referred to as the Deccan trap and the black soil region. Perhaps the most appropriate name is the latter on account of the particular type of soil found here. Roughly the area comprises of a large portion of land lying south of Satpura line and embracing the plateau portion of the Bombay hresidency, western half of C. P. and Berar and the western palf of Hyderabad. It is a land of bare undulating plains from

which at places rise small flat top hills. The soils are naturally dark in colour. They are retentive of moisture and are suitable for crops that do not require much moisture. On account of the particular type of soil it is not possible to pursue irrigation. Although the rainfall is not heavy about 70% of the land is cultivated, 17% is covered by forests, and only 18% is waste or not available. Rice is of no importance and claims only $1\frac{1}{2}\%$ of the total cropped area. Millets occupy 47%, cotton 21% and wheat 6 $\frac{1}{2}\%$. Besides these oilseeds are also important. It is the most important cotton producing area of the country. Although a major portion of the cotton cultivated here is of native variety. The high plains of Berar are the favourite cotton lands and are well situated for supplying cotton to the mills in Bombay. Average density of population is low (160 persons.)

Sholapur, Poona and Nagpur (302,000) are the chief towns of the region. Nagpur is the capital of Central Provinces and an important railway junction. Poona is the summer capital of the Bombay Presidency and commands one of the gaps leading to Bombay. Sholapur along with Amraoti commands attention as collecting centres of the cotton lands of Bombay and Berar.

7. The North-Eastern Plateau comprises of five sub-divisions in (1) the Central Indian Highlands, (2) Chota Nagpur Plateau, (3) Eastern Ghats, (4) Chattisgarh Plain (Mahanadi valley) and (5) the Godavari valley.

The rainfall in the region as a whole is high everywhere, more than 40" and hence greater than in other parts of the Deccan plateau.

In Chotta Nagpur plateau, only about 40 p. c. of land is cultivated, while about 50 p. c. is under forests or wild. A number of primitive tribes live in the hills and forests of this region. Santhals are the most numerous. The Central Plateau is similar to No. 1 on a small scale. Jubbulpore in the Narbada valley is an important city and important railway junction.

The Eastern Ghats here present very primitive and mild conditions. The population is less than 40 persons per square mile. There are no railways here.

The Chattisgarh Plain, lying between the three areas of highlands just described, is a valley Plain (Upper Mahanadi Valley) now cleared for cultivation of rice. A railway line connects Raipur with the port of Vizagapatam.

The valley of Godavari comprises of the eastern parts of the Wardha valley and the Wain-Ganga Valley-plain. Although it is a continuation of the cotton fields of Berar, the soil here is not of the type of the black-cotton soil. The amount of rainfall received here is also larger and hence rice is the main crop. Some cotton is also grown. Nagpur, the capital of C.P., lies within this region. It is important for its cotton mills.

(8) The Central Indian Foreland is a plateau extending between the Ganges Plain and the valleys of Son and Narbada with an upward

rise. The region lies entirely in the Ganges Basin. The rainfall here is usually more than 40 inches and rice gains in importance. The town of Jubbulpur, already described, lies on its southern borders. It has a few cotton mills.

(9) The Rajput* Upland Region is a drier region. Here millets and cotton are important crops. Five distinct units may be recognised here: (1) The Aravalli range and its north-eastern extensions. (2) The forested hills of Rajputana. (3) The valleys of Eastern Rajputana; (4) The Malwa plateau built up of Deccan (and the Vindhya range). (5) The Narbada Valley.

Bhils are the most important tribe, living in the hilly forests of the region. Ajmer, Jaipur and Udaipur are important towns known mostly for their historic buildings.

(10) The Thar or Great Indian Desert occupies the greater part of Rajputana and small portions of southern Punjab and eastern Sind. The annual rainfall is even lower than 10 inches. On account of the absence of surface streams and due to desert conditions, irrigation is not possible. The Ganga Canal in Bikaner is a fine example of ambition to serve his people on the part of the Maharaja of Bikaner.

The population is very thin.

The Northern Mountains.

These may be divided into the following regions. This division is based on rainfall distribution.

1 The Eastern (or the North-Eastern) Hills include the eastern hills that separate India from Burma and the Assam hills—the chief being Pakoi, Naga, Manipur (Plateau) Lushai, Chittagong and Chin hills.

Taken as a whole the rainfall in this region is heavy as it lies directly on the route of the Bay of Bengal branch of the S. W. Monsoon. A good area is covered by forests (15 p.c.). Only about 4 per cent is suitable for cultivation. A number of tea gardens are situated on the slopes of Assam hills. Fruit trees do well in the Garo hills.

Owing to rough topography and the parallel arrangement of unbroken ridges, communications and population are in a very unhealthy state. In the forests and hills live a number of tribes who have destroyed vast areas of forests by burning off to obtain small tracts of land for cultivation.

2. The Himalayan Region comprises of the Himalayan Mountain chain approximately from 5,000 feet upwards. Here the unhealthy, forested slopes are left behind and an invigorating healthy atmosphere pervades the environment. The Ganges divides this region into 2 subdivisions (1) the eastern and (2) the western. The latter is characterised by lower rainfall, while the western enjoys a heavy rainfall. The eastern region rises abruptly from the plains and very soon the Himalayan heights are reached while the western is characterised by a gradual rise. With this region the layman usually associates the hill-stations of India.

* Lying mostly in Rajputana.

The eastern Himalayan region has a very low average density of population. Darjeeling, the summer capital of Bengal, is the largest town in this region. Other towns are Katmandu (in Nepal) and Kalimpong.

The western half of the Himalayas includes Kashmir and the adjoining ranges, namely Karakorum, Ladakh, Zaskar, and the Himalayas proper (Lesser and Greater). All the five rivers of the Punjab except the Sutlej, rise within this region (Great Himalayas) and flow through cutting across the Lesser Himalayas. The Sutlej rises in Tibet and cuts right through this region.

The rainfall in this region much lower and shows a gradual westward decrease. Agriculture is limited to rougher and coarser grain, is carried on in the valleys. Population is on the whole very low.

Kashmir and the Kashmiris are the most important items in the region. Srinagar on the Dal Lake is the most important town.

3. The Sub-Himalayan Region consists of the foothills between the plains and the mountains as well as the lower slopes of the Himalayas up to 5,000 feet. Like the Himalayan region, it also can be divided into (1) Eastern (wetter) and (2) western (drier) regions. Originally the whole of this region was covered by sub-tropical forest.

The eastern half could be divided into (1) The Tarai (or Duars) consisting of swampy, unhealthy lands lying at the foot of the mountains; and (2) the low hills situated upwards along with the slopes of the outer Himalayas. The natural vegetation of the foothills is monsoon forests of the valuable sal. Tea gardens are well established in northern Bengal. The U. P. portion of the Tarai is now cultivated. Taken as a whole the density of population in the region is scanty though in better cultivated places in U. P. and Bengal, it reaches quite high a figure.

The Western Sub-Himalayan Region is much drier than the eastern half already described. The Tarai is absent. However, the region could also be subdivided into the lower and the upper half. The upper half is covered by forests of the Chir pine. The lower half is covered by Dhak forests. The tree and its yield can be used in many ways. Wheat, maize and gram are grown in places which have been cleared. The number of such places is ever on the increase. There is a line of important irrigation works within this region. The density of population is quite high, as high as 300 or more in some places.

4. The Tibetan Plateau falls partly (only a small portion) within the state of Kashmir. But as politically Tibet falls outside India, it has not been described here.

5. The North-West Dry Hills Region roughly includes the Frontier Province, the Punjab districts of Jhelum, Rawalpindi and Attock and some hilly area in the north. About 35 p. c. of the area is sown and only about 8 p.c. is covered by forests owing to low rainfall. The region may be studied under the following sub-regions:

The area lying east of the Indus in the Punjab (Cis-Indus Tract) is a dry sandy plateau. There is very little rainfall and practically no facilities for artificial irrigation. Millets and other dry crops are cultivated. There is an oilfield at Khaur.

The Indus Valley is an area more favourably placed and with brighter potentialities. The floods from the river are the main characteristics of the region and they control the harvests in the region.

The area lying between the Indus and the Frontier hills comprises of the Peshawar, Bannu and Dera Ismail Khan Plains (Trans-Indus Tract). The vale of Peshawar is well irrigated and has corn-fields and fruit orchards. The Bannu Plain is quite fertile and well irrigated specially around Bannu proper. The plain of Dera Ismail Khan is a dry desert. At places of heavier rainfall, some cultivation and grazing is carried on. The population is quite heavy in favourable spots.

The Frontier Hills lie to the west of the plains described above. These hills are arid, barren and treeless. It is on the valleys that some cultivation is carried on—Khurram valley being the most important. Large number of sheep are reared on the grassy hillsides. The inhabitants are mostly of the Pathan species (Waziries, Afridis and Orakzais).

The percentage share of individual crops in the North West hills is :

Wheat	...	...	44 p. c.
Millet	...	...	18 "
Barley	...	...	7 "
Maize	...	...	7 "
Other foods	...	...	12 "
Oilseeds, cotton, and fodder			12 "

Wheat is grown mostly in irrigated lands while millets is grown on lands dependent on rainfall

Both railway and road transport are quite developed in this region except in the isolated hills. A railway line runs right up to the Afghan Frontier through the Khyber Pass.

Peshawar and Rawalpindi are both important for their strategic positions on important trade routes. Peshawar is also the seat of the Frontier Government. Kohat, Bannu and Dera Ismail Khan are other important centres.

6. The Plateau of Baluchistan Lying outside the mountain wall of the country—joined with India by Bolan Pass Baluchistan is out of the monsoonic influences and hence it is very dry (rainfall 10" or less). Politically it includes a few British districts and the native states of Kalat and Las Bela. Its area is about 135,000 square miles but its population is not dense, the density being about 6 per square mile. Pathans and Baluch are the chief people here. The average height of the plateau is between 1,000 to 3,000 feet above

sea-level. The climate is of the extreme type, having both summer and winter temperature maxima. The higher parts have snow in winter. On account of the absence of any large surface waters, there are no irrigational facilities except Karez. The chief crops are wheat, millets and fodder. Date-palms are found near the coasts and provide food both for men and animals. The people are mostly nomads and wander about with their sheep and goats and cattle. Quetta, the largest town of the region, is situated at the head of the Bolan Pass. It is the seat of the British administration in the region. Sibi is another British station.

A number of caravan routes are situated across Baluchistan to Iran. One of them in the north has now been severed by a broad-gauge railway.

Note. For other schemes of the regions of the country please see next chapter. As stated before, Stamp's scheme is at the moment most appropriate and universally acceptable and therefore the same has been summarized in these pages. For a fuller treatment please see Stamp's 'Asia' (1939) published by Matthew—pp. 251-341.

REGIONAL CONTROVERSIES

1. **Climatic Regions** :— In the chapter on climate, we mentioned that the 13 rainfall divisions of India as given by Williamson and Clarke, should serve the purpose of a division of the country into climatic divisions quite well ; and that is why we gave a detailed summary of these divisions in the text. Kendrew's scheme as given in his ' *The Climates of the Continents*' is perhaps the only appropriate scheme. According to him the basis is the rainfall distribution. Dudley Stamp in his ' *Asia*' follows the same scheme with only slight modifications ; the chief deviation being the separation of 'Tropical' from 'Continental' India. The dividing line runs roughly along the Tropic of Cancer and takes a north-eastern turn in the east to include portions of Bihar, Orissa and Bengal. The line divides the North-eastern Plateau and the Middle Ganges Valley (Kendrew) into two regions, the northern one has been named the 'Transitional Region' by Stamp.

' The scheme is as follows :—

1. **The Himalayan Region** :— Examples Simla and Darjeeling. (Though it has nowhere been mentioned, it seems obvious that this region should be divided into the eastern and the western halves, the former being much wetter. The sub-Himalayan region also stands distinct from the plains and the mountains and thus it may also form a separate division, to be further subdivided into the wetter eastern and the drier western halves, as has been done in the case of natural regions).

2. **The arid North-West Plateau**—including Baluchistan and North-West hills. Example Quetta. (In Baluchistan the conditions are markedly continental).

3. **The very wet (above 80") West Coast** sub-divided into (a) the Northern half (or Konkan) having rainfall during five monsoon months, (b) the Southern half (or Malabar) having rainfall for about ten months. The amount of rainfall is also much heavier in the Southern half of the western coast. Bombay is an example of the Northern and Trivandrum of the southern region.

4. **Bengal and Assam**. Chittagong is the example.

5. **The North-East Plateau and Middle Ganges Valley**—Example, Nagpur. (This has been further divided by Stamp into (1) North-East Plateau and (2) Middle Ganges Valley (Transitional region).

6. **Carnatic or Tamil region**; example, Madras (Winter rains).

7. **Southern and North Western Deccan**—Example, Hyderabad Deccan.

8. **Upper Ganges Plain**—Example, Delhi.

9. **Northern Punjab Plains**—Example, Lahore (Winter Cyclonic rainfall).

10. **Arid North-West Lowland**—Example, Karachi.

2. **Natural Regions.** The division of the country into natural regions has been carried out by a few British geographers. M. B. Pithawala, S. P. Chatterji and Qazi Saed-ud-Din Ahmad have also made similar attempts but their divisions are as yet under discussion and not finally accepted by geographers. Dudley Stamps's scheme has received universal approval and as such we have also stuck to it in this volume. But we feel that a student of geography should also be acquainted with other ideas on the subject so that he may get some material for thought.

McFarlane was perhaps the first geographer who for the first time, divided India into natural regions. As will be seen later on all the people have first divided India into 3 or 4 broad physical divisions and then subdivided them. Only their subdivisions vary from one another. Although McFarlane's divisions are rather broad, he deserves all credit for his pioneer work. McFarlane's scheme of Natural Regions of India as given in his 'Economic Geography' (Pitman) is :—

A. Extra-Peninsular :—

1. North-west Mountain Borderland.
2. Himalayan Region.
3. North-east Hill Tracts.
4. Lower Ganges—Brahmaputra Plain.
5. Middle Ganges Plain.
6. Upper Ganges Plain.
7. Punjab Plains.
8. Sind Plains.
9. Thar Desert.

B. Peninsular :—

10. East Coastal Area.
11. West Coastal Area.
12. South Archean Deccan.
13. North-east Archean Deccan.
14. Rajput Uplands.
15. Gujarat Lowlands.
16. Deccan Trap areas including Kathiawar.

In 1922-24 Stamp drew up a fresh scheme of natural regions for use in his various text-books entitled the *Regional Geographies of India*, etc., etc. Later Prof. J. N. L. Baker constituted W. Arden Wood's unpublished ideas into a definite scheme which was as follows :—Geography, Volume XIV (Summer, 1928) pp. 447-455.

1. The Himalayan Regions.
 - (a) Eastern.
 - (b) Western.
2. The Sub-Himalayan Region.
3. N. E. Hill Tracts.
4. North-West Frontier Region.
5. The N. W. Dry Area.
6. The Assam Valley.

7. The Delta Lowlands.
8. The Indo-Gangetic Plains (East)
9. The Indo-Gangetic Plains (West)
10. Aravalli-Vindhya Uplands.
11. Kathiawar and Gujarat (Transition between Sind and West Coast).
12. East Coast.
 - (a) North (b) South.
13. Berar-Orissa Highlands.
14. Chattisgarh Plain.
15. Central Highlands.
 - (a) West
 - (b) East.
16. Higher Plains of Berar and Nagpur.
17. Deccan Region.
 - (a) Bombay-Deccan.
 - (b) Deccan Southern.
18. West Coast.
 - (a) North.
 - (b) South.

It was a strange coincidence that both Stamp's and Baker's schemes were practically the same, although "there is considerable overlapping and uncertainty of homogeneity" in both. In the absence of a better scheme, Stamp's scheme has been universally accepted as it is more "rational and welcome." It may, however, interest some geographers to learn what a young Indian geographer, I. D. Malhotra has got to say about some of Stamp's regions. (The Natural Regions of India, Punjab Geographical Review—Vol. I—1942).

Dudley Stamp has divided the coastal region, west of the Indian plateau into two natural regions (a) the Gujarat region and (b) the West Coast region. The entire west coast region has certainly the same physical features, but in geological structure, the northern part of west coast differs from the south-western coast. In the northern part, the rocks essentially consist of the Deccan lavas. Besides, the northern part of the western coast also differs in climate, for in the northern part the rainfall entirely occurs in the monsoon season and thus there is no rainfall for seven months. In the south-west, rainfall is also received during the months of the south-west monsoons; rainfall is also received during the months of November and December. However, considerable rainfall is also received here in the months of April and May. During these months the winds are on-shore and the rainfall is over 10 inches along the south-western coast. Thus here there are only three months when there is no rainfall. On account of these differences in climate, Kendrew in *The Climates of the Continents* has also divided the western coastal region into two climatic regions. As a result of these differences in climate the agricultural products of the south-western coastal region are also different. Thus in Travancore pepper shrub is cultivated and rubber trees are also planted. On account of these differences in the geological structure and climate, the western coastal region should be divided into two natural regions (a) the Karachi coast and (b) Malabar coast.

The Punjab plains also present a somewhat similar case, for in the western Punjab the rainfall is everywhere less than 20 inches and a considerable area has a rainfall of even less than 10 inches. Again Kendrew also considers the western Punjab as a separate climatic region from the eastern Punjab. Here the natural vegetation consists of thorny bushes, and cultivation of crops is not possible at all without irrigation.

On the other hand, in the eastern Punjab the rainfall is over 20 inches and, therefore, the natural vegetation consists of scrub forests and cultivation of dry crops is possible in certain areas without irrigation. Thus the eastern part of the Punjab resembles the western and the southern parts of the United Provinces and it should be considered a part of this natural region, where the western Punjab should form a separate natural region.

Again in Stamp's book, the central India plateau has been considered as a separate natural region. Like the north-eastern plateau the central India plateau is made up of archæan rocks. It also receives rainfall between 40 and 80 inches and hence it also resembles the north-eastern plateau in natural vegetation. It is, therefore, not quite clear why central India plateau should be considered as a separate natural region. The presence of the Mahadeo hills & Maikal range does not appear to be a sufficient reason for the formation of this region into a separate natural region. *The central India plateau should therefore be considered as a part of the north-eastern plateau.* However, it may be considered as a separate sub-region just as Eastern Ghats and Godavari Valley have been considered as separate sub-regions.

Only two schemes have been published in India* One by Dr. M. B. Pithawala was presented by him to the Lahore session of the Indian Science Congress in January, 1939 and the other was evolved by Dr. Kazi Saeed-ud-din (Indian Geographical Journal—July-September, 1944.)

1. Pithawala's Scheme. Inspired by the very interesting lecture† by Professor Ogilvie of Edinburgh, entitled "The Technique of Regional Geography with special reference to India," he brought out a scheme of *Physiographic Divisions* of India as he is very much against a division into *natural regions* "A geographical survey of any region," he says, "must necessarily take full account of its physiography, and therefore the divisions, made of India on a basis other than physiographic, must be highly defective and narrow in outlook. He bases his division on 'Geology and topography (rocks, drainage etc) as controlled by the internal and external agencies working on them'. While making sub-divisions, he says, there is no harm in taking help from other sciences as Botany, Zoology, Meteorology etc. His scheme is :—

A. Three chief divisions :—

1. Extra-Peninsular Mountains.
2. The Indo-Gangetic Plain.
3. The Peninsular Area.

B. Sub-divisions of the above.

1. *Extra-Peninsular Mountains.*

(a) Western, lands.

1. Kirthar Mts. 2. Kohistan Section.

(b) Greater Himalayans :—

1. Northern Himalayan Section 2. Southern Himalayan Section.

* Dr. S. P. Chatterjee is reported to have evolved a scheme based on Forest Flora, surface relief and climate. But it has, to the best of our knowledge, not been published anywhere.

† At the Calcutta session of the Science Congress in Jan. 1938.

(c) Middle Himalayas.

1. North-West Dry lands. 2. Kashmir Valley.
3. Himalaya proper.

(d) Sub-Himalayan Region.

1. Frontier Section. 2. Siwalik section.

(e) Eastern Highlands.

1. Assam-Burmese Yomas. 2. Irrawadi Basin. 3. Shan Plateau.
2. *Indo-Gangetic Plain.*

(a) Lower Indus Valley.

1. Western Valley Section. 2. Eastern Valley Section.
3. Indus Deltaic area.

(b) Upper Indus Valley.

1. Potmar Section. 2. Punjab Plain.

(c) Desert Province.

1. The Pat Section. 2. The Thar Section.

(d) Upper Ganges Valley.

1. The Doab Section. 2. Rohilkhand Section.

(e) Middle Ganges Valley.

(f) Lower Ganges Valley.

1. The Brahmaputra Valley. 2. The Ganges-Brahmaputra Plain. 2. The Ganges Deltaic Area.

3. *The Peninsular.*

(a) Rajput Uplands.

1. North-Western Section. 2. Mewar plain. 3. South-Eastern Section.

(b) Deccan Trap Region.

1. Central India Tableland. 2. Western Ghats. 3. Bombay Deccan.

(c) North-Western Tableland.

1. The Mahanadi Basin. 2. The Godavari Basin. 3. The Eastern Ghats.

(d) Southern Plateau.

1. Cuddapah Section. 2. Bellary District Section.
3. Nilgiri Hills. 4. Tamil Section.

(e) West Coast Province.

1. Northern Section. 2. Southern Coast Land.

(f) East Coast Province.

1. Northern Coastland. 2. Carnatic Section.

Later Professor M. B. Pithawala made some alterations in his scheme in view of the all-round criticism. The following alterations have been made (The Madras Geographical Journal, October-December, 1939 issue).

1. Extra-Peninsular Mountains :

- (a) The Kirthar-Sulaiman ranges have been considered as one and continuous.
- (b) The Kashmir Valley is renamed *Dun-Section*.
- (c) The Potmar region has been renamed *Potmar section* and included in the *Western Highland Province*.
- (d) Shillong Plateau is treated as a separate region from the *Yomas*.

2. Indo-Gangetic Plain :—

- (a) The Upper Indus Valley is subdivided into (1) The *Doab Section*. 2. *Punjab Proper*.
- (b) The *Doab Section* of the upper-Ganges Valley is renamed *Jumna-Ganges Doab*.
- (c) The *Lower Ganges Valley* now has (1) *Brahmaputra Valley* (2) *Old Ganges Delta* and (3) *The New Ganges Delta*.

3. The *Peninsular Area* :—The two coastal strips are not treated as separate provinces but as the *shore-facies* of their respective structural provinces viz. the *Konkan coast* belonging to their respective structural provinces. *Kathiawar* is called the *Western Peneplain*. The *North-Eastern Fordland* is subdivided into (1) The *Mahanadi Basin* (2) The *Godavari Basin*. (3) The *Eastern Ghats*. (a) *Forest Belt*. (4) *Golconda Coast Shore Facies* of the *Eastern Ghats* (including the delta of *Mahanadi*, *Godavari* and *Kistna* rivers). The *Southern Plateau* is divided into (1) *Cuddapah Section*, (2) *Bellary Section*, (3) *Nilgiri Section*, (4) *Tamil Section*, (5) *Malabar Coastland* and (6) *Coromandal Coastland*.

Dr K. S. Ahmad's Scheme :—Dr. Pithawala's scheme was severely criticised by Dr. Ahmad at Benares in 1941. He has suggested an entirely new scheme. Dr. Ahmad believes that "in a scheme of Physiographic divisions relief and land forms should rank the main basis of classification". His scheme is :

A. Chief Relief Divisions :—

- 1. The mountains of Extra-Peninsular India.
- 2. The Indo Gangetic Plain.
- 3. The Deccan Plateau.
- 4. The Coastal Lowlands.

B. Sub-divisions :—

1. Mountains of Extra-Peninsular India :—

- a. The Himalayan Mountains.
- b. Siwalik Region.
- c. Sulaiman Kirthar Hills.
- d. North-West Intermont Plains.
- e. Patmor Plateau.
- f. The Salt Range.
- g. Patkai-Lushai Hills.
- h. Shillong Plateau.

2. Indo-Gangetic Plain.

- a. Tarai Region.
- b. Chos Region.
- c. The Upper Indus or Punjab Plains.
- d. The Lower Indus Plain.
- e. The Ghaggar Plain.
- f. Gangetic Plain.
- g. Gangetic Delta.
- h. Brahmaputra Valley.

3. The Deccan Plateau.

- a. The Sand-dune region.
- b. Aravalli hills.
- c. Malwa Plateau.
- d. Central Indian Ranges and Intervening Valleys.
- e. Deccan Lava.
- f. North-East Plateau.
- g. East Central Plateau.
- h. Lower Godavari Valley.
- i. Southern Plateau.
- j. Western Ghats or Sabyadri.
- k. Eastern Ghats.
- l. Gujarat Paneplain.

4. Coastal Lowlands :—

- a. West Coast.
- b. East Coast.

It appears from a study of Dr. Ahmad's scheme, that he divides India into pure '*Physiographic regions*', as distinct from '*natural regions*' which take into consideration other geographical aspects too. If Dr. Ahmad wants his scheme to serve only as '*relief regions*' we have no comment to make although we might slightly differ in the matter of details; but if he wants to replace the scheme of natural regions as given by Stamp and others, the scheme is not quite acceptable.

Dr. Pithawala on the other hand confuses '*relief regions*' with '*natural regions*' with the result that we are prepared to accept them neither as relief '*regions*' nor as '*natural regions*'. We come to the conclusion that for the present till better schemes are forthcoming, Dr. Ahmad's scheme be used by geographers as purely '*a relief or physiographic scheme*' while Dudley Stamp's scheme be used as a scheme of pure '*natural region*'. We are, however, inclined to believe that a *few modifications* (according to climate) may render Dr. Pithawala's division as a very hopeful scheme of '*natural regions*'.

PROVINCIAL STUDIES

India is for political and administrative purposes, divided into British provinces and a number of Indian States. There are also a number of foreign possessions of very small sizes (see figure 5).

British India is divided into eleven governors' Provinces and five Chief Commissioners' Provinces. Its total area is 910,507 sq. miles and total population is 295, 808, 722 souls. The governors' provinces are Assam, Bengal, Bihar, Bombay, Central Provinces and Berar, Madras, North-Western Frontier Province, Orissa, Sindh and United Provinces. The Chief Commissioners' Provinces are Ajmer-Merwara, Coorg, Baluchistan, Delhi, Pauth Piplodha and the Andaman—Nikobar Islands.

The Indian states number about 584 and have a total area of 712, 508 sq. miles and a total population of about 93,189, 233 souls. The states enjoy complete internal sovereignty but they owe treaty obligations to the crown. The size of Indian states ranges from Hyderabad equal in area to Italy and the state of Bilbain having a total population of 27 persons.

The foreign (French and Portuguese) possessions occupy 1740 sq. miles.

French India ; The French possessions in India, a relic of the French expeditions to India from 1603 onwards, cover 200 square miles and have a population of about 320,000. Pondicherry, the headquarters of a French Governor, is the chief settlement. It is on the Coromandel coast about 100 miles south of Madras. The other possessions are Chandernagore in Lower Bengal, Mahe on the Malabar coast, Karikal also on the Coromandel coast, and Yanam, a few miles south of Cocanada. The French establishments rallied to the Free French movement after the defeat of France in June 1940.

Portuguese India : Portuguese possessions in India cover an area of 1,600 square miles and have a population of about 600,000. They date from the Portuguese invasion in the early sixteenth century. They are situated within the limits of Bombay province and consist of the province of Goa on the Arabian Sea coast ; the territory of Daman with the small territory called Pragana-Nagar Avelly on the Gujarat coast, at the entrance to the Gulf of Cambay ; and the little island of Diu with two places called Gogola and Simbor, on the southern extremity of the Kathiawar peninsula. All these three territories, ruled by a Governor-General, constitute what is called by the Portuguese the State of India.

It is not necessary at this stage to give a very detailed account of the provinces and the Indian States as it will mean a lot of repetition and overlapping. Only brief accounts of some of the political units are given in the following pages.

ASSAM¹

Assam is situated in the North-East of the country and has an area of 67,334 square miles excluding the Tibet area. It is roughly as large as England and Wales. It has been a separate province since 1912, being a part of Bengal before that. It may be interesting to learn the considerations underlying this separation.

1. The people of this province have no racial affinity with the Bengalese.

2. There is also no linguistic affinity.

3. Assam is economically self-sufficient, having both agricultural and mineral potentialities.

4. Bengal was very unwieldy in size from administrative consideration.

Physiographically Assam may be divided into the following divisions:—(1) Slopes of the Northern mountains (2) The Brahmaputra or Assam Valley in the North (Goalpara, Kamrup, Nowgong, Darang, Sibsagar, Lakhimpur, Balpara and Sadiya). (3) The hills and ranges separating Assam from Burma. (4) The Assam Plateau extending from the Eastern hill ranges and comprising of the Khasi, Jaintia, and Garo hills. (5) The Surma Valley in the south and continued into Bengal (Sylhet district and portions of Cochar).

The province of Assam receives the heaviest rainfall in India—annual average being 80". It is only in the Brahmaputra Valley, that the rainfall is less, because the rainbearing winds are obstructed by the Garo and Khasi hills. The Valley remains mostly swampy and malaria is rampant. Assam is a land of immense and vast forests most of which still lie unexplored although they are rich in economic potentialities in the shape of minerals and timber. Assam has oil and coal. There are 8,377 people employed in the oilfields and 6,376 in coal mines. Tea on the slopes and rice and jute in the valleys and plains are the main crops. Railways are not well developed in Assam owing to obvious physical and climatic considerations. The Brahmaputra is largely used for transport purposes. A railway line joins the upper part of Assam valley with the plains and the delta region in Bengal and goes as far south as Chittagong. A branch line goes on to Sylhet. A war-time road goes on from Manipur and Dinapur to Burma across the hills. The total population of Assam in 1941 was 10,205,000 persons. Agriculture employs about 89 per cent of the people and industry about 9 per cent. Tea industry is the most important industry of the province. There are about 1,125 tea gardens and about 638 tea estates in Assam.

Natural Regions:—The five divisions mentioned above also form the natural regions of the province. They are now discussed individually.

1. The Lower Himalayan Slopes roughly lie along the northern boundary of Assam. At places they cross into the Assam valley for several miles. Owing to heavy rainfall, these slopes are densely forested. Large areas have been cleared for tea cultivation. Jute and rice are grown in the valleys lying between hill ranges and on the terraced slopes. The people belong mostly to the Tibetan race and live in small villages.

2. The Brahmaputra or the Assam Valley has an area of about 27,692 square miles and a population of about 5,695,669. It is an alluvial plain measuring about 450 miles from north-east to south-west with an average width of about 50 miles. It is surrounded by hills on all sides except in the west. The Valley gets rainfall for about eight months in a year, the average being 95 to 100 inches. The soil in this region is a mixture of clay and sand. Evergreen forests are largely found in this region, but wherever they have been cleared rice and jute are cultivated. The submontane tract is mostly dependent for its agriculture on artificial irrigation. About 21% of the total area is cultivated (48% waste, 16% forests). About 65% is under rice, 8% under tea and 5% under jute. Oilseeds occupy 9%. There are some good deposits of coal and petroleum, the latter at Digboi and the former in Shibsagar and Lakhimpur. The output of coal in 1939 was 238,102 tons.

The density of population in 1941 was 206 persons per square mile as compared to 171 in 1931. The Valley attracts a huge number of immigrants from Bihar, Bengal and United Provinces for work in the tea gardens.

There are only two railway lines in this valley (1) The Eastern Bengal Railway goes as far as the bank of the river Brahmaputra just opposite Gauhati. (2) The Assam-Bengal railway goes from Gauhati to Sadiya. Another branch of the railway crosses the plateau of Assam into Bengal.

There are a few roads running through the valley. There are cart roads from Gauhati to Shillong and from Dinapur to Manipur state. River Brahmaputra is used for transport by means of boats for the greater part of its length.

3. The Eastern Hills. The direction of these hills as they sweep from the far corner of Assam is from N. E. to S. W. in the beginning but later on after half of their own length they suddenly take a curve and turn southwards and continue till they come to Cape Nagrais where they disappear near the coast. This hilly region is narrow in the beginning, broad in the middle and narrow again in the latter part. In the north the hills are called the Parkoi hills, next come the Naga hills then further we come to the Manipur plateau, then come the Lushai hills which to the further south change into Chin hills which are again followed by Arakan hills. The Chin hills and the Chittagong hills are not in Assam.

These hills are not very high. Generally they are 6000 or 7000 feet high. The highest peak is Mount Victoria (in Burma) which is 10,000 feet high.

The hills enclose long narrow valleys. The lower slopes of the hills are covered with evergreen forests and bamboo and cane trees. Patches of pine forest are found between 4000 and 4500 feet. Further up broad-leaved trees are found and further on grass covered mountain peaks are seen. Snow does not occur on the hills because they are not very high.

From the Naga hills a branch runs from east to west. These hills form the plateau of Assam. They are called Khasi, Garo and Jaintia hills.

The high ranges in the Eastern hills region are called "The Eastern Wall" as they serve the purpose of a wall between India and Burma. The hill and mountain ranges are very steep. They enclose valleys which are quite separated from each other. It is very difficult to move from one valley to the other or from one hill to another. There are four gaps in the Wall (1) Tuza gap, (2) Manipur gap, (3) Taungup gap, (4) Angap. The former two are in Assam.

Everywhere, on the slopes of these mountains we find thick wet forests and a thick tangle of canes and bamboo. The trees are evergreen. On the lower slopes of the mountains the chief tree is the oak which has got broad leaves. As we go higher we come across coniferous forests. Here and there between 4000 and 4500 feet of height we come across patches of pine forests. On the tops of the mountains we find green grass. Here and there we find mountain flowers growing in the grass. Terraces are made here and there. Maize and rice are cultivated in these steps. Manipur has got an outstanding importance among those parts which export rice. Manipur is a plateau surrounded by hills. Even then the rainfall is over 60". We do not find many people as we travel through the region. As we travel towards the north we find that villages are situated on the spurs of the mountains. These villages are surrounded by patches of cultivated land. The people are not very civilized. They like to adhere to their old customs. They very seldom come down to the plains. Several languages are spoken in these hills. Nearly every well-known valley has its own language.

4. The Assam Plateau. The plateau consists of three well known ranges viz., Garo, Khasi and Jainti. The hills run from east to west. They face southwards. The slope to the north is very gradual. The monsoon winds rise from the Bay of Bengal and meet these mountains. Much of the rain falls on the southern slopes of these hills. Cherrapunji gets 500" of rainfall annually. The hills keep on rising above Cherrapunji and then the plateau slopes to the north. On this plateau is situated the town of Shillong which, although sheltered by the southern mountains gets 83" of rainfall. The plateau although situated in the rain-shadow, is sufficiently wet.

The temperature in the plateau is quite low. The summers are cloudy and hence the daily range of temperature is not large.

The lower slopes of the hills are covered with evergreen forests the chief trees being the sal and the oak. These trees thrive upto a height of 3,000 feet. Above this line conifers take the place of evergreen trees. Higher up, the slopes and the peaks are covered with grass. Most of the forests are not available for use. A very small area in the plateau is cultivated. The gardens and the rice fields occupy most of the cultivated area. Maize is also grown on the terraced slopes. Rough cotton is also cultivated in drier areas specially in those situated in the rain-shadow. Some limestone is quarried in Khasi hills.

The population is not very dense in the plateau, the average density being about 50 persons per square mile. Ninety per cent of the people are agriculturists. Many people come from Bihar, Bengal and Madras to work in the tea gardens. The hills contain many tribes like the Nagas, Chins and Climboks.

Shillong*, the chief town of the region, is the capital of Assam. It is situated on the Khasi hills. Shillong is a modern town situated amidst an environment which is totally primitive. It is more easily reached from the north side from the railway running along the Brahmaputra valley. There are two approaches to Shillong from Calcutta, one via Gauhati and the other via Sylhet. A distance of about 80 miles is covered by motor to Shillong as there is no railway up to the town itself.

The town of Shillong occupies an area of about 6 sq. miles at an height of about 5,000 feet above the sea-level. But the town itself is situated on level ground.

5. The Surma Valley situated partly in Assam and partly in Bengal† has an area of about 7,450 sq. miles and a population of about 3,757,781. In Assam it includes the district of Sylhet and the lowlands of Cochar district and is by far the most fertile and the mostly thickly populated part of Assam; average density being 400.

The valley is a flat plain, about 115 miles long and 60 miles broad shut up on three sides by hills. It is an alluvial tract. Owing to the rivers being sluggish the fields are annually enriched with silt. Northwards the valley merges into mountains.

Like the Brahmaputra valley, the valley also receives heavy rainfall, the annual average being 128 inches. Cherrapunji in this region receives perhaps the heaviest rainfall in the world about 600 inches.

*A very good account is given in *Geography of Shillong* by Miss Sudbira Roy, Calcutta Geographical Review September 1944.

†The valley is linguistically and socially a part of Bengal and its inhabitants have few points of contact with the dwellers in the Assam Valley.

Large areas of this region are forested. The ever-rising banks of the rivers are very fertile areas dotted with villages. About 36 per cent of the total area is actually cultivated although about 70 per cent is cultivable. The northern part of Cachar abounds in bamboo forests. Grass and long reeds also occupy some area.

Rice is the chief crop of the region. *Aus* and *Aman* paddy are cultivated and the fields are high. Tea is also cultivated. The following table gives percentages under individual crops.

Rice—80·6	p. c. of cultivated area.		
Tea—6·3	"	"	"
Oilseeds—1·6	"	"	"
Jute—0·9	"	"	"
Others—10 0	"	"	"

The chief peculiarity about the Surma valley is that it contains numerous tea gardens. In Sylhet and Cochar about one third of the people are engaged in tea production.

BALUCHISTAN

NOTE :—(An account of Baluchistan Plateau has been given in the section entitled Natural Regions. This may be supplemented by what given is below).

Baluchistan has a total area of 134, 638 square miles. Politically it consists of British Baluchistan, tribal areas and states namely Kalat, Kharen and Bela. The province runs with a frontier of 723 miles with Afghanistan, 520 miles with Iran (Persia) and 471 miles of coast line. It encompasses several miles of the London Karachi air road. Its importance is more strategic as "India's sentinel on the most gigantic historical gate way of India."

Baluchistan is a dry Plateau with a rugged surface having an average height of 1,000 to 3,000 feet above the sea-level. As it is cut off (from the rest of India) from the monsoonic influences by high mountains the precipitation is the lowest possible and nowhere it is more than 10". The rain falls during the cold weather storms. The temperature conditions present very extreme types like the dry regions of the Punjab. Some parts even have snow falls during this period.

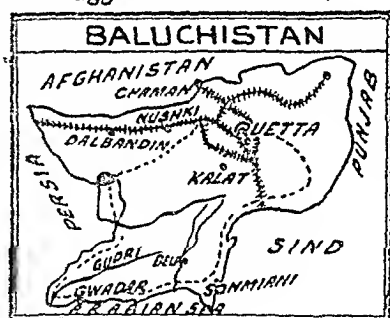


Fig. 67.

The valleys have fairly fertile soils and some cultivation is carried on with the help of 'Karez' and flood water from the very small streams. Millets is the chief crop and the staple food. A little wheat and some fodder is also raised. Dates are important near the coast. Some fishing is also carried on the sea coast.

The total population in 1941 was 502,000 persons. Most of the people live in small villages and hamlets scattered all-over. The difficult relief and unfortunate climatic conditions combine to put the population figure very low—the average density being much below 10.* The majority of the people here lead a nomadic life and wander about with their flocks. Most of the people belong to the Islamic fold.

Only about 10 per cent of the people live in towns. It is however a reality that Quetta and perhaps Sibi are the only towns in Baluchistan. Quetta alone accounts for more than 70 % of the entire urban population. It is situated at the head of the Bolan pass which is so far the easiest and perhaps the shortest route between India and Baluchistan. The other route lies along the coast. A railway now runs along the north of the country to Persia.

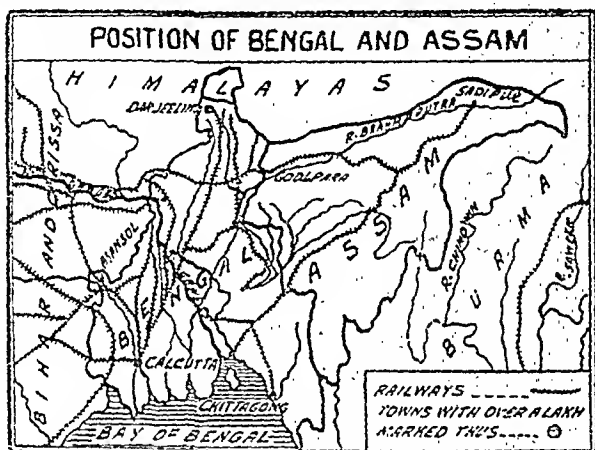


Fig. 68.
BENGAL

Bengal has an area of 82,876 square miles and a population of 61,640,377 and occupies a greater part of the lower Ganges valley or the Delta Region. It is triangular in shape having its apex in the Himalayas and its base along the waters of the Bay of the Bengal in the south. The Ganges, the Brahmaputra and the Meghna are the most important factors in the geography of this Province.

Geologically the province presents a splendid unity, the small mountainous portions in the north and east and a small area in the west belonging to the slopes of Chotta Nagpur plateau being the only exceptions.

Dr. S. P. Chatterji divides Bengal into three divisions according to soils:—

1. Residual soils of (a) the Eastern or Chittagong Hill Region (b) The northern or Himalayan region and (c) the south-western plateau region.

*There are more men than women and it is often noticed and two, three or even more persons have a common wife.

2. New Alluvium of the greater portions of the province lying near the many rivers. This type covers more than half of the area.

3. Old Alluvium of the regions situated away from the present site of rivers specially near regions under No. 1.

Climatically Bengal presents a transition between the constantly high temperatures and great humidity of the south of the Peninsula and the dry bracing air and great range of temperature which characterize the north-west (Kendrew). As a whole it is one of the rainiest of the provinces of India as it faces the S W. Monsoons (Bay of Bengal Branch) earliest. Winter is comparatively a shorter affair. Summer has comparatively lower temperatures owing to greater humidity but the conditions are very damp and trying. The areas near the sea enjoy the sea-breezes. The rainfall is apparently the most important factor in the climate of Bengal which is primarily an agricultural country.

According to rainfall distribution,* Bengal may conveniently be divided into East and West. East Bengal receives an average annual rainfall ranging from 80 to 100 inches. The rainfall is as a rule regular and failure is very rare. Rainfall is ample specially during June—September, the period of summer monsoon. West Bengal receives an average of 50 to 60 inches annually. These low figures are due to the fact that Western Bengal is situated away from the direct route of the S W. Monsoon (Bay of Bengal Branch) and comes under its influence only after it has been deflected westwards by the eastern hills and the eastern Himalayas.

According to present estimates about 60 per cent of the land in Bengal is under agriculture, 6 per cent is covered by forest (forests are mostly in Sunderbans and in the eastern and the northern hills). There is about 10 per cent of wasteland situated mostly in western Bengal, Barind and Madhopur. Rice is the chief crop covering about 75 per cent of the cultivated land. Jute is also important specially in the East.

The easiest and the most useful way to study a region like Bengal is to divide it into Natural Regions. Dr. S. P. Chatterji's† scheme of Natural Regions of Bengal is very acceptable and we have used his scheme in the following pages. The account of these regions has also been summarized from his excellent account. He divides Bengal into the following regions.

- | | | |
|---------|---|----------------------------|
| Uplands | { | 1. Himalayan Region. |
| | | 2. Chittagong Hill Region. |
| | | 3. Rarb Region. |

*S. K. Surri's 'A note on the average intensity of Rainfall in Bengal'—Calcutta Geographical Review—June 1944, may be studied by ambitious readers

†S. P. Chatterji, *The Place of Geography in National Planning* Presidential Address before the Geography and Geodesy Section of the Indian Science Congress, 1940.

- Lowlands (occupy a major part of Bengal,
1. Barendra Region.
 2. Brahmaputra-Meghna Region.
 3. Bagri Region.
 4. Hoogly Region.
 5. Lower Ganges Region.
 6. Lower Padma-Meghna Region.
 7. Sundarbans Region.

1. The Himalayan Region is in the extreme north of Bengal and is also known as Sikkim Himalaya. The climate here is bracing and the region boasts of many hill stations. The rainfall is heavy and forests are the general feature. Mountain slopes upto 6,000 feet have been cleared for tea plantations. Higher up we have forests and alpine vegetation. Just at the foot of the mountains there is a belt of old alluvium having a heavy amount of rainfall. The region has unlimited water power resources specially in the Tista river, which await exploitation. Tea industry is the most important industry of the region.

2. The Chittagong Hill Region occupies the south-east portion of the Province and consists of long parallel ranges encompassing between them four important valleys. These valleys are used for agricultural purposes, rice being the chief crop. Owing to heavy rainfall the region is as a whole covered with dense forests. Owing to its comparatively southern position and lower altitude, temperature conditions are lower here. The water—power resources of the Kamaphali and other rivers await development. Besides rice, tea, sugarcane and bamboo are other products of importance.

3. The Barb Region occupies a narrow stretch of land along the western border of Bengal and runs from the south of the Ganges to very near the sea board—comprising parts of Murshidabad, Bankura, Midnapore and the whole of Burdwan district. The region looks like an undulating plateau. The rainfall is not high, hence irrigation is the main problem. The Eden Canal, taken out of the river Banka, deserves mention. It has been supplemented by a cut from the Damodar. The Damodar canal with its headworks at Eakoi-Bera, is a later development. It is suggested that the flood waters from the rivers may be stored up for irrigation in dry periods.

4. The Barendra Region* occupies the Rajshahi division between the Ganges and the Brahmaputra. A great part of the region is 'capped' with old alluvium known as 'Barind'. A number of low hills with intervening wide depressions have been given to the region by fluvial erosion. The depressions have good soil for rice cultivation. Owing to low rainfall in some parts, irrigation is the main problem. Tanks are used in the central parts. Tobacco is the chief crop in East Barendra (Rangpur) and paddy in West Barendra which is the most populated part in the whole region.

*May be further divided into East, West and North Barendra.

5. The Brahmaputra-Meghna Region comprises the districts of Mymensingh, Dacca and Tippera. The Madhopur jungle in Dacca consists of alluvial tracts and is dissected by a number of streams. The chief rivers of the region are the Jamuna, Padma, Meghna and they are supposed to be rich in fish. The area is agriculturally good, the chief crops being jute and sugarcane. The region claims about 40 per cent of the total jute-lands of Bengal and about 25 per cent of sugarcane. Rice and oil seeds are also important (mostly *til* and *mustard*). The lower part of the Padma plain consists of fine loam and is certainly the most important agricultural region of Bengal.

The climate is maritime monsoon owing to the oceanic influences of the Bay of Bengal. The winter temperature is about 65°F. The annual rainfall is about 89" decreasing from north to south.

Owing to the lack of coal there is no manufacturing industry worth the name. If, however, the water-power resources of the Himalayan region were developed, things might take a turn for the better.

6. The Bagri Region lies to the east of the Rarb area and to the south of the Barendra tract. The area is a flat alluvial plain watered by a number of rivers chiefly the Bhagirathi (Hoogly), Jalangi and Mathabhanga which have for long constituted the chief means of transport. Now of course railways have taken much of the traffic.

The annual rainfall is about 55 inches. The mean temperature is 50° F in winter and 85° F in summer. The Kalantar tract between Bhagirathi and Jalangi is very arid and infertile and is usually referred to as the 'region of death' and its people are the first to feel the pinch of famine when it comes.

7. The Hoogly Region may be called the industrial centre of Bengal. The average rainfall is about 58", it being heavier in the south. Very little or no rain falls during the winter months. Jute and rice are the main crops and the yields of both are higher than perhaps in the rest of Bengal.

8. The Lower Ganges Region includes areas from Khulna and Faridpur districts. The rivers of this region, unlike those of the Bagri region, are still engaged in their land-building work. The chief problem of the region are the marshes which are, however, getting reclaimed for cultivation. The average rainfall is 73". Since the whole region is only slightly raised above the floor level the difficulty about finding a suitable site for building habitations is most acute. In several villages, houses are built on artificially raised ground.

9. The Lower Padma-Meghna Region is the wettest area in Bengal, average rainfall being 114. The land gets better and more fertile as we move away from the coast towards the hill region mentioned earlier. A number of small islands are found near the

mouth of the Meghna, and these are being steadily reclaimed for agriculture, the chief crops being rice and betel palm.

10.* The Sunderbans Region occupies a large portion in the districts of 24 Parganas and Khulna. The region presents the appearance of marshes and swampy islands separated by river estuaries and a network of tidal creeks. The greatest problem is that of drinking water. The soil is very fertile and plant-growth is rapid which often creates complications for the cultivator who has to face forest-clearing problems every year.

Fisheries of Bengal.† It is an important topic and deserves special mention as fish forms an important part of a Bengalee's diet.

The area of water surface in Bengal is very large and it is doubled during the rainy season. The most important districts in this connection are in the lower half of the province. Bengal has about 8,000 sq. miles of fisheries during the dry season—the area during the rainy season is enormously increased.

Most of the fish in Bengal is had from rivers, canals, tanks, jheels and from river estuaries. The Chilka lake and the forested fisheries of Puri and Balasore are also important sources. Fish culture in tanks is large. Marine fisheries have hitherto been entirely neglected although they are very rich and hold huge potentialities.

The total supply, however, is not quite sufficient to meet the entire demand. The industry is carried on in the most unorganised and primitive manner and thus involves low yields and a lot of waste. Better methods and greater official attention is needed to put the industry on a sound economic and commercial footing.

The total population of Bengal is 61,640,377. Its density is about 616. The total urban population of Bengal does not exceed 5,000,000, out of which more than 40 per cent is found in the three cities of Dacca, Howrah and Calcutta. There are two types of towns in Bengal, industrial and non-industrial. The industrial towns like Calcutta and Howrah are centres of jute spinning, collection and pressing, coal and iron industries. About 90 per cent of the total population is rural. Most of them are engaged in cultivation of rice and jute. Only 8 per cent of people are engaged in industry and trade.

Calcutta and Dacca are the largest cities of Bengal, the latter is also the capital of Bengal. Titagarh, Bhatpara and Serampore are important jute manufacturing and rice milling centres. Asansol and Raniganj are important coal centres.

* Note. Dudley Stamp in his 'India' divides Bengal into four regions: (a) Northern sub-Himalayan region and Himalayan (b) Eastern Hills (c) Western plateau and (d) The Deltas region—further divided into (1) The Ganges-Brahmaputra Doab (2) The old delta or central and Western Bengal and (3) The New Delta and Surma Valley.

† See 'Fisheries of Bengal' by A. K. Benerjee (C. G. R. January 1942) from which we have drawn freely.

BIHAR

The combined province of Bihar and Orissa measuring about 111,702 square miles, was split up into two *i. e.* Bihar and Orissa in 1937. Bihar including Chotta Nagpore measures about 83,000 square miles and has a population of about 36,340,000 persons.

Bihar is purely an agricultural tract of land and exceptionally fertile. It forms the eastern portion of the Gangetic valley. The province falls easily into three regions.

- (a) North Bihar } Middle Ganges
- (b) South Bihar } Valley.
- (c) Chota Nagpur Plateau.

(a) North Bihar lies north of the Ganges and measures roughly about 21,796 square miles. It is a flat alluvial plain gradually rising towards the foot of the Himalayas. The north portion is characterised by a number of marshes and pools some of which are big enough to be called freshwater lakes. The Kahar Tal in Monghyr and a chain of 43 lakes represent the deeper portions of some abandoned river beds.

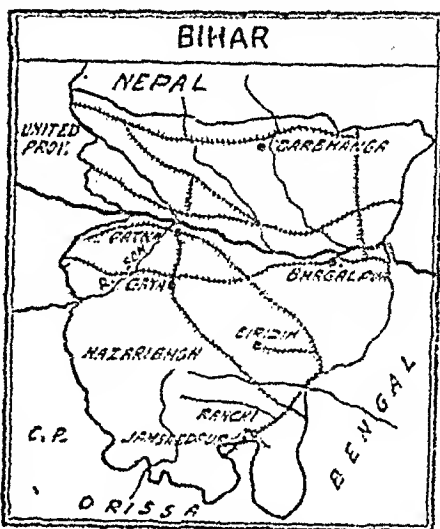


Fig. 69.

The region receives an average rainfall of about 50 to 55 inches annually. It is well distributed in the year and enables three crops to be raised. The northern part can depend on irrigation from the tanks etc. Canal irrigation is not possible as the rivers are non-perennial. Well irrigation is also not possible as the wells cannot stand owing to inundations. Agriculture is, therefore, insecure during draught years.

About 62.5 percent of the total area is cultivated, out of which only 10.3 percent is irrigated. The plain of Tirhut is the best area in the region and there the pressure on the soil is the maximum. Rice is the chief crop and claims 42 per cent of the cultivated area; maize occupies 8 per cent, other cereals and pluses claim 32 per cent.

North Bihar is the chief source of saltpetre in India. Saliferous earth is found in the vicinity of villages.

The density of population is very high more than 600. There is considerable emigration specially to the tea gardens of Assam.

(b) South Bihar is the portion of Bihar lying south of the Ganges. It comprises the districts of Shahabad, Patna, Gaya and Monghyr. The greater part of it is an alluvial plain sloping gently northward to the Ganges but farther south the soil changes and becomes more undulating. Much of the southern area is a broken country with a

fringe of jungle. The soil is poor and has little or no irrigation. It yields precarious crops. The land to the north, on the other hand, is highly cultivated, extensively irrigated and well populated.

Its climate is drier than that of North Bihar. The annual rainfall averages between 40 to 45 inches. Some portions receive even less than 40 inches of rain annually. "In South Bihar rainfall is scanty and the soil is unretentive of moisture owing to the rapid drainage of the country. At the same time the system of storage tanks and water channels (*Akars* and *Pynes*) has failed to ensure agricultural security, because under such a system the supply of water depends on local rainfall and fails completely when it is needed most and also because there is no rational control of the flow and distribution of water. Moreover canal irrigation, which is confined to small areas in the west, has little scope for development because excepting the Sone, the rivers are non-perennial and too small to feed any canal system."* Well irrigation has also no scope here. Only in south Bhagalpur and south Monghyr wells constitute an important source of irrigation. In other districts the rocky soil in the south has prevented the development of well irrigation. In the north of these districts, where the sub soil water is near the surface, well irrigation is superfluous. Moreover the demand for water during the critical period as *hathiya* asterism is too great to be met by wells, which are ordinarily suitable for the irrigation of the winter crops.

The following figures show the general agricultural situation :—

57·6 P. C. of the total area cultivated.

23·3 „ „ cultivable area cropped.

37·7 „ „ of cultivable area irrigated.

Rice appears to be the main crop. The area under wheat is quite large. The most remarkable growth seems to be that of oil seeds. In South Bihar winter rice is a more important crop than the autumn rice. Winter rice, as is well-known, co-exists with a high degree of agricultural insecurity. "If there is a failure of rainfall during the critical period of *hathiya* asterism towards the end of September or the beginning of October, the winter rice crop cannot mature, because in this region it is not possible to irrigate the rice fields by artificial means to any considerable extent in the event of a failure of *hathiya* rainfall."† In South Bihar *aghani* is the principal harvest. The succeeding second crops, therefore, consist of cheap catch-crops because the more valuable *rabi* crops, like wheat and barley, are sown before the *aghani* crop is harvested. In abnormal years such catch-crops cannot

*Dr. B. N. Ganguli, "Agricultural Regions of India," in "Economic Problems of Modern India" 1939, p 13.

† Trends of Agriculture and Population in the Ganges Valley, Dr. Ganguli, 1938, p. 181.

mitigate economic distress caused by the failure of the winter rice crop. Winter rice, together with the inferior *rabi* crops, raised by means of double-cropping, predominates in South Bihar."*

This region is rich in minerals. It possesses the richest mica mines of the world. Mica is quarried in the districts of Gaya and Monghyr. The total output of these districts in 1939 was 15,871 cwts of mica and the average daily employment in the mica mines was 779 persons. There are slate quarries in the Kharagpur Hills near Monghyr. "Several minerals are found in conjunction with mica. In the pegmatite veins which are the source of mica there have been discovered (i) large crystals of beryl with clear fragments that might be cut into aquamarines, (ii) blue, green and black varieties of tourmaline, (iii) small quantities of apatite (a phosphate of lime), which are thrown away with the waste mica, and (iv) molybdenum, which occurs as isolated plates".† But at present the latter are of minor economic importance.

The density of population is high but lower than the northern part of the province.

Like North Bihar, this region also loses heavily due to the emigration. The pressure on the soil and the absence of enough large scale industries to absorb host of landless labourers are the principal causes for this outflow of people. Most of the emigration is periodic. "Every year thousands leave their villages, after gathering the winter crops, to work in the mills, docks and factories or on roads, fields and railways in Bengal or Assam. They return, for the most part, with their savings after four or five months."

(c) *Chota Nagpur Plateau* is the elevated country extending from the Gangetic valley to the hilly tableland of the Central Provinces and approaching close to the Bay of Bengal on the South-east...(The word plateau is a technical expression for an area of which the lowest levels are at a considerable height above the sea). This region comprises the districts of the Chota Nagpur Division, the Santal Paraganas, Angul and the tributary States of Orissa and Chota Nagpur (area 66,624 sq. miles).

"It is a rugged region of inequalities, consisting of a succession of plateaux, hills and valleys, drained by several large rivers, such as the Damodar, Sarakar, Subarnarekha, Brahmani, Baitarani and Mahanadi. The land is still largely covered by forest, and is thinly peopled the whole area belongs to the same geological formation".‡ Numerous aboriginal tribes live here.

This region receives on an average a rainfall of 50 to 55 inches annually. In this tract the water runs quickly off the slopes so that the higher lands are soon dry, even after a heavy shower. For its

* Dr. Ganguli "Agricultural Regions of India" in "Economic Problems of Modern India", 1939, p. 1.

† Dr. Ganguli, *Op. cit.* p. 15.

‡ Bengal, Bihar and Sikkim L. S. S. D'Malla 1917, p. 24.

conservation the slopes are laid out in a series of terraces, fields spreading downwards in a fan shape. They have earthen banks at the lower side to retain the water, which passes down from field to field, moistening each in turn. Artificial irrigation is necessary in this tract for the cultivation of rice and other crops because of its rapid drainage. Well irrigation is used for winter crops.

In this tract there are extensive areas of rock and laterite and gravel, which are unfit for cultivation, and except in the valleys, the patches of fertile ground are small and infrequent. The region has very poor chances of a prosperous agricultural development.

The following figures throw light on the general agricultural situation in this region.

Percentage of Total Area		Percentage of cultivable area		Percentage of culti- vated area
Cultivable	Cultivated	Cultivated	Double- Cropped	Irrigated
57.1	30.4	53.2	4.4	10.2

Rice is the main crop. Maize is an important crop of the *kharif* harvest in this region. This crop can be successfully grown over wide climatic ranges. It is a valuable crop as it matures early and ensures agricultural security. By supplying the cultivator with food it enables him to sell most of his *rabi* crops. Chota Nagpur agricultural resources are limited and failures of the harvests occur periodically, but scarcity does not press hardly on the hardy aboriginal races, who can supply their needs from the forest and, even in the good years, make considerable use of edible jungle products, such as the fruit of the *Mahua* tree.

There is considerable culture of *lac* in the districts of Ranchi and Manbhum.

The mineral wealth in this tract is great. Here we find the richest coal-fields in India. Fine coal mines are found at Giridih, Jharia, and Daltonganj. Coal deposits are also to be met within Sambalpur, though they are not so rich. Copper is found in Singhbhum. There are diamond mines in Sambalpur. Rich iron mines are located in Singhbhum and at Sakchi we have the Tata Iron and Steelworks, the greatest and the largest of its kind in India. In Hazaribagh there are some of the richest mica-producing mines of the world. Manganese is found in Singhbhum and there are some deposits of tin and antimony in Hazaribagh. Stealite is found all over Chota Nagpur.

The following figures give the normal yearly output :—

Coal	...	14,843,633	tons
Iron	...	1,543,934	tons
Manganese	...	35,803	tons
Chromite	...	4,476	tons
Copper	...	360,216	tons
Mica	...	69,990	cwt.
Stealite	...	955	tons

This region is the home of numerous aboriginal tribes. There are Santals in Hazaribagh, Manbhum and Singhbhum; the Mundas in Ranchi; the Oraons in Ranchi and the Tributary States, the Hos in Singhbhum, and Gonds in the Tributary states. The name *Kol* is commonly used to designate these aboriginal tribes. Most of them have kept their purity of race and retained their tribal languages and customs, but some such as the Gonds and the Bhumijs have been largely Hinduized.

The unstable agriculture of this region as well as its topography has much to do with its low density of population, which is 200 per square mile.

There are very few large towns in Bihar. Patna, the capital, is also an important railway junction and an industrial town. Ranchi is the summer capital of the province. Other towns are Bhagalpur, Monghyr, Muzaffarpur and Darbhanga.

BOMBAY

Bombay Presidency has an area of about 76,443 squares miles* and a population of 20,849,840. Upto 1917 Sindh was also a part of Bombay. Stamp divides the province into three natural divisions.

(1) Gujrat (including Kathiawar and Baroda) occupies a peninsula in the north and a portion of the province and consists of a good number of native states. Baroda state is made up of many isolated tracts of country north of Bombay. The region is a low plain occasionally dotted with small hills. Climatically it may be called a transition between the dry Sindh and the Thar in the north and the west central plains in the south. The peninsula of Kathiawar suffers from invariable rains. Cutch is even drier and more treeless than Kathiawar.

Baroda and Ahmedabad are the largest towns in the region. Baroda is the capital of the Baroda state and has important cotton mills. Surat

on the Tapti was once a leading port of the west coast.

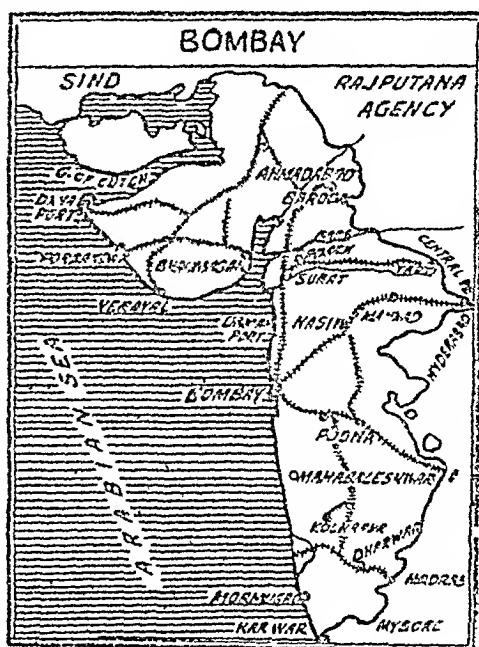


Fig. 70

*151,543 square miles including states and agencies and Sindh

(2) The West Coast Region is a very wet region, the rainfall being heavier towards the south. The hill slopes too receive heavy rainfall and are mostly covered with forests. The coastal plains were also covered with forests but now most of the area there has been cleared for cultivation of rice which is the most important crop and occupies more than half of the cultivated area. The region falls into four parallel strips (1) the mountain slopes (2) the flat alluvial plains below (3) near the sea are lines of sandbanks on which cocoanuts thrive and (4) the mangrove swamps that thrive at intervals therein.

The swift rivers of the slopes and the heavy rainfall there present great possibilities of water-power development. The Tata's schemes are already well-known.

Bombay is the only large town and the most important port of India.

(3) The Bombay Deccan (or the Deccan Lavas Region) means that part of Bombay that lies behind the Western Ghats stretching inland for more than 190 miles. During some geological period this area was covered with great sheets of lavas which have now withered into a dark soil suited for the growth of cotton*. Roughly the region measures about 53,327 square miles and has a population of 11,606,000.

The area lies in the rain-shadow of the Western Ghats and has an average rainfall of about 20 to 25 inches. The southern parts get somewhat heavier rainfall. The valleys of the Godavari, Bhima and Kistna are the best portions of the region and it is here that the deep black soil is met with. The main agricultural problem of the area is the water supply.

About two-thirds of the total area is cultivated. Some part of the region is covered with forests specially on the slopes of the Western Ghats. Only about 4-5 per cent of the cultivated area is irrigated. Most of the crops grown here are dry crops.

Jowar— 30 per cent of the cultivated area.

Bajra— 25

Cotton—13

Pulses—10

Rice— 2

Jowar and Bajra are the staple food of the people. The different sub-zones of cultivation centre round the main staple Jowar. The best agricultural regions occupy the adjoining banks of the Godavari and the southern districts of Karnatak. The tract between the Godavari and the Bhima is also agriculturally important. Another good region extends from Khandesh to Belgaum along the eastern slopes of the Western Ghats. Owing to a lack of rainfall irrigation is best developed in this region. Fruit and vegetables are important crops of this region.

No minerals of any importance except some pottery clays, specially in Belgaum district are found in this region.

Poona and Sholapur are the most important cities. Poona is the summer capital of the province and commands one of the gaps leading to Bombay across the Ghats.

*Besides having a portion of Bombay, it also covers Berar and Western Hyderabad.

The total population of the province is about 20,49,840, out of this about 65 % are agriculturists, while only 10 to 12 % are engaged in industries or allied trades

Not many persons are engaged in mining, salt and saltpetre being the most important items. Manganese is also important. The density of population in Bombay is about 175 persons per square mile. The scantiest population is found in Kathiawar, Cutch and in North and Central Gujrat. The density in the Deccan is moderate, about 216 in 1941. South Gujrat, the west coast and the valleys of Nerbada and Tapti are thickly populated

CENTRAL PROVINCES AND BERAR

The Central Provinces and Berar occupy an area of about 131,557 square miles in the heart of India and have a population of 116,813,000. Many Indian states of different sizes are included in this region.

C. P. and Berar is one of the richest areas of the country both from the point of view of agriculture and mineral resources. It is, therefore, unfortunate that the level of economic development of the province is very low. The chief minerals of the region are coal, bauxite, manganese, iron and copper. Although there are vast reserves of coal (17 centres in Chattisgarh area; 8 in Panch valley, 5 in Kanhan valley, 12 in the Satpura region and 10 in the Wardha valley) only a small percentage has yet been exploited. The chief reason for this slow development of mineral industry is perhaps the very poor state of transport facilities. Other minerals too have only been ill-developed for the same reasons. Bauxite occurs in the Bihar Plateau and in the Kathi-Marwara Basin. Copper occurs in Saleemabad, while iron fields are situated in Katni, Saugor, Chanda and in Pranhita valley besides a few other centres. At present there are about 140 smelting centres. Most of the manganese mined in the region is exported. To prevent 'this drain of the national resources' the development of ferro-manganese industry seems desirable.

The forest wealth of the province is also vast. Besides timber, lac and wild silk are gifts that are there without being taken advantage of. There are also a number of rich pastures. Only about 38 per cent of the total area is cultivated. The chief problem of the province is irrigation. Only about 4 per cent of the cultivated area is irrigated. Rice, cotton and wheat are the three chief crops of the region and they occupy distinct regions in the province. Cotton predominates in Khandwa lava plains, Tapti alluvial basin and in the Purna valley. Rice

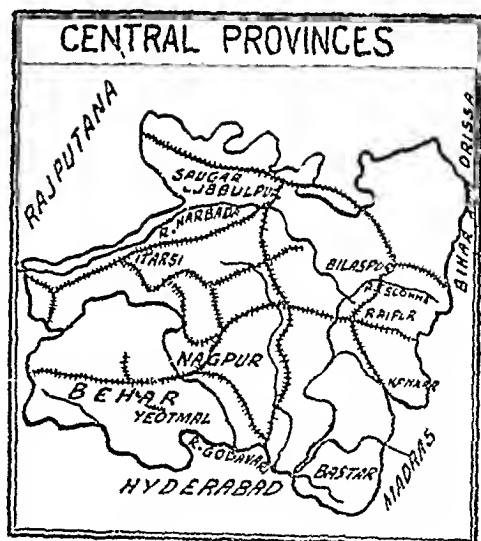


Fig. 69

is the chief crop in the Chattisgarh plain. Wheat occupies a definite block in the western half.

Berar has an area of 17,808 square miles and was leased in perpetuity to the Central Provinces in 1903 by the Nizam of Hyderabad whose property it became in 1853. It is the most developed region of the combined province and has rich cotton soil. Cotton is the chief crop of the region. It is first collected at Amraoti and Akola and then sent to the Bombay mills.

It is very fortunate for us that recently two Calcutta professors made a detailed regional survey of this area and divided it into 13 physiographic divisions*—certainly an improvement over Stamp's Regions.

- (1) The Saugor-Damoh Plateau.
- (2) The Marwara Basin.
- (3) The Narmada Basin.
- (4) The Northern foothill zone of Satpura.
- (5) The Satpura Hills.
- (6) The Purna Valley.
- (7) The Southern Plains.
- (8) The Balaghat Bhandara Hills.
- (9) The Ajanta Plateau.
- (10) The Chattisgarh Plain.
- (11) The Korea-Chand Bhakar Plateau.
- (12) The Surgija Basin.
- (13) The South-eastern Plateaus.

As this is the best division that we have come across so far, it has been thought useful to summarise the relevant portions here. Those wanting to know greater details should read the paper by Chatterji and Basu as given in the Calcutta Review (See footnote).

1. The Saugor-Damoh Plateau really forms the south-eastern extension of the Malwa plateau (north of Vindhya). Its elevation is from 1,000 to 2,000 feet. The higher elevation of its western part is clothed with teak forests. The plateau is drained by many streams flowing northward through broad valleys following the general slope of the region. The eastern plateau is formed of sandstones of Vindhayan age covered with thick newer alluvium in the north. The town of Saugor is situated in the lava country and Damoh on the Vindhayan sandstones. An alluvial plain extends northwards from Damoh. The Marhattas developed this town as a defensive

*S. P. Chatterji and Baikash Basu, 'The physiographic and economic basis of urbanisation in the Gond, and adjoining lands of the Central Provinces'—Calcutta Geographical Review—March 1944.

point and an old fort stands as a reminder of the past. The population has grown to 63,933 in 1941 from 42,330 in 1901. Asbestos and lateritic iron ores are found in the locality though they are not developed industrially. The town of Damoh with a population of 28,795, is a collecting and distributing centre for the local trade. Both of these towns have developed economic contact with Cawnpore on account of easier communications across the Malwa plateau.

2 **Murwara Basin.** This basin is really the northern extension of the Narmada valley. Its average elevation is 1,200 ft. The basin has a distinct industrial character. There are large units of cement and lime works at Katni and Murwara dependent upon limestone and shale obtained locally. The population of Murwara at the last census was 24,630. There are good deposits of bauxite near Katni, the alumina content ranging between 40 and 65%. The area is also rich in other metallic minerals, copper and iron ores, which, if properly utilized will help in the development of metallurgical industry in this area.

3. **The Narmada Valley.** The valley extends from Sihora on the north east to Handia on the west and covers an area of over 4,000 sq. miles. The elevation of this province varies from 1,500 ft. on the west to about 1,000 ft. on the east. The Narmada river flows along the northern edge of the valley from near Jubbulpore through alluvial basins alternating with rocky gorges. The northern portion of the valley is occupied by the headwaters of the Hiran, a tributary of the Narmada. To the immediate north of the river rises boldly the Vindhyan mountains presenting a steep cliff southward. The northern limit of the valley is, therefore, determined by the east-west running Vindhyan scarp. The valley extends southward as far as the foot of the low hills formed of upper Gondwana sandstones, and at the two ends the alluvium-filled valley merges into lava plains or plateaus.

Agriculturally the Narmada valley is a very productive area. Wheat forms the staple crop, though in the eastern part of the valley rice gains importance due to higher precipitation. Water for agricultural purposes is obtained from deep wells sunk along the edge of the plain. The valley slopes being steep, the waters of the Narmada cannot be utilised for irrigation purposes. The topography of the Narmada valley is such that it does not offer much opportunity for the development of urban centres on the river itself.

Jubbulpore is the most important town in this zone dominating the economic activities of the people. The presence of a rocky basin close to the Narmada provided an excellent site for the location of the city. The low hills overlooking the city gave it a defensive advantage. To-day important industrial, commercial and administrative functions are integrated in this city. As to the modern industrial establishments mention may be made of cotton mills, an electrical generating and transforming station, oil mills, sugar factory

and cement and lime works. The collection and distribution of the agricultural products of the valley and the neighbouring areas are the most important commercial activities of the town. Railways radiate from the town in three directions: the first, linking it up with the towns of the middle-Ganges valley in the north; the second, connecting it with the towns of the Narmada valley and beyond; while the third getting it nearer to Nagpur, the administrative and the industrial capital of the country. Jubbulpore still possesses a flourishing trade in the handicraft products, especially in the images carved out of marble and soapstone which are found within the area. Deposits of bauxite occur in many places in the Jubbulpore region. An aluminium industry can be developed at Jubbulpore if cheap power can be brought to this area. Thermal power stations located on the coalfields of Korea, Mohpani or the Kanhan valley can transmit power in bulk to Jubbulpore or the raw material can travel to the power sites if the latter are developed on a large scale. Jubbulpore has an important trade in building stones. The marble is exported in large quantities. The town has developed wide regional contacts and is attracting to itself the economic activities of the Narmada valley. With further development of the geographic and economic realities of the region the city is destined to develop into an important metropolis of the country. West of Jubbulpore stands Narsingpur on the small stream Singri. Narsingpur exports the timber wealth of the Chhindwara forests. Pink marble is found in Narsingpur. Iron ores both hematite and limonite occur irregularly distributed in the area but the town does not seem to profit by their occurrence. Gadarpur stands on the Shakkar, another south-bank tributary of the Narmada. It is an important grain exporting centre of the region. It cannot boast of any modern industrial plant but handicraft trade in weaving, pottery etc. are carried on. Ceramic clays of the Chhindwara and Jubbulpore area are utilised. Itarsi is growing into a very important rail-road junction. It carries the major portion of the outgoing commodities of the neighbouring area. Its population at the last census was 14,269. Hosangabad is perhaps the only important urban centre situated on the bank of the Narmada, at a point where crystalline rocks are exposed in the valley floor which provide building materials to the town.

4. Northern Foothill Zone of The Satpuras. This province extends in the same direction as the Narmada valley province, hemmed in-between the Satpuras on the south and the Narmada on the north. It can be divided into a number of sub-regions: (i) Khandwa lava plain on the west; (ii) Morand sandstone plateau; (iii) Pachmarhi hills including the Derva synclinal valley; (iv) Dudhi sandstone plateau; and (v) the Lakhnadon lava plateau on the east. The height of these plateau increases from 1,000 ft. on the west to 2,000 ft. on the east. The ground also rises southward to about 3,000 ft.

5. The Satpura Hills consist of a number of parallel ranges and plateaus. This physiographic province consists of the following sub-regions: (i) Satpura Range; (ii) Tapti basin; (iii) Tapti plateaus of Multai and Khamla; (iv) Chhindwara upper plateaus and Mahadeva hills; (v) Chhindwara-Seoni lower plateaus; (vi) Mandla-Balaghat plateaus of Paraswara, Baihar, Ramnagar and Ramgarh.

The Satpura range descends westward from an elevation of about 3,000 ft. near the source of the Ganjal river to just over 2,000 ft. north of Burhanpur. The range slopes rather gently northwards but presents a line of cliffs on the south overlooking the Tapti valley. The whole of the range is formed of basaltic lavas. Asirgarh is a strategic point commanding the route to Deccan from northern India. The eastern half of the Satpura range is more rugged. Timber forms the main wealth of the region and agriculture plays a very subordinate role in the economic life of the people. Roads are few and far between.

The Tapti occupies a rift valley, south of the Satpura range. The whole of the basin is formed of basaltic lavas. The valley slopes of the Tapti are too steep for agricultural purposes, except where the valley widens and is filled up by older alluvium. The town of Burhanpur stands on this rich alluvial patch. The Tapti basin is being gradually opened up for cultivation. Forests still predominate in many parts and provide a valuable source of income. The region too exports its cotton to the Bombay market. Burhanpur has a considerable trade in the export of raw cotton. It has two large cotton mills and many cotton ginning and baling factories. There is also an oil mill in the town.

The mineral resources of the valley have not yet been fully exploited. Some oil wells are situated in the northern parts of Cachar. Some platinum is washed out from the banks of Dibing river. There are valuable coal deposits in this region. Coal seams outcrop in most of the deep river plains. Limestone outcrops beyond Barasansa.

To the east of the Tapti basin lies the Tapti plateau, the highest lava plateau in the Satpuras, rising to an altitude of 4000 ft. The Tapti divides this into two parts—the (eastern) Multai plateau and the (western) Khamla plateau. Both of these are rolling uplands and support long grasses. Subsoil water is close to the surface and water can be obtained easily for irrigation. The Tapti, Wardha and Bel rivers rise on the Multai. Near the source-spring of the Tapti has sprung up the religious town of Multai, now well connected with metalled roads. The region watered by the Machna and the Bel is a rich and fertile tract. A number of villages including the towns of Betul and Badnur have sprung up in the valley zone.

North of the Betul valley rises another high plateau, which extends east-north-east from the Machna valley to the Wainganga.

In fact it consists of three plateaus separated from each other by the Kanhan and the Pench rivers. The eastern plateau is composed of basaltic lavas and contains red soil which is valued as the best for timber trees. The greater part of the plateau is covered with forests. The steep slopes support dense vegetation, but the cliffs are almost bare. There is a future in the coal fields when they are opened up. The lack of transport is another factor conditioning the backward state of the area.

To the south of the central plateaus stand a group of lower plateaus with an average elevation of about 2000 ft. Generally speaking, the low-lying tracts contain rich black loamy soil, the slopes brown loam and the tops gravelly red soil. There is excellent pasturage throughout the region, and hence cattle are bred specially in the Kanhan valley, west of Chhindwara and along the edge near Khamarpani and Kurai.

Chhindwara is situated at an elevation of about 2000 ft. The town is only a centre of local trade. The handicraft trades in pottery and weaving are quite important. A small quantity of tussar silk, obtained from wild cocoons, is woven in the town. Marble and ceramic clays of the district are being used. Although bauxite and marble occur in the locality, they are not exploited to any great extent. The coalfields of the Chhindwara district are only inadequately surveyed. Power generation in these fields will open up the country for proper exploitation of the resources. Manganese ores of good quality occur in the district and are exported.

The easternmost part of the Satpuras consists of a number of high plateaus bordered on the east by a line of eastward-facing escarpments, known as the Mekhala range (Maikala). This range runs in a north-easterly direction from Nandgaon to the Amarkantak knot and then turns northwest till it meets the Vindhyan scarp north of Jubbulpore. It appears that the Mekhala range properly marked the site of an ancient shore line, to the east of which sediments of the Cuddappah age were deposited, and that in the Deccan trap period the range had prevented the lava flows from flowing further east. To the north of the Narmada river the plateau has been dissected into rugged hills; very few fertile valleys occurring in them. Hence it is thinly populated. The country is more open and contains rich fertile tracts.

The Parasuara plateau lies between the Banjar on the west and the Wainganga on the east. It has sandy soils and no agriculture.

The Baihar plateau rises to an average elevation of about 1800 ft. It is watered by the northward flowing Banjar river which near its confluence with Narmada flows through rich loamy soil. This tract is intensively cultivated. Elsewhere the soil is sandy and infertile and clothed with dense forests.

Further east lies the Ramnagar plateau on which rises the headwaters of the Burhner. This is covered with rich black loamy soil. It is also an important timber area, and the sal forests are capable of yielding good crops when cleared.

The Ramgarh plateau is the easternmost one, rising to an altitude of 3000 ft. and is composed of basaltic lavas. It is watered by the Khermer and a number of short perennial streams. It has immense agricultural possibilities.

The town of Mandla standing at the confluence of the Banjar and the Narmada, is the only centre of any consequence. The economic resources of the region still remain undeveloped, although there are rich bauxite deposits in the Baihar plateau. Coal and metallic minerals occur not very far from each other.

6. The PURNA VALLEY : Like the Narmada valley the Purna valley is a structural and topographic depression. The Purna flows through an alluvium filled valley.

The Purna valley is a distinctly *urbanized* zone, containing as it does 16 large towns. The prosperity of the valley zone is due to cotton which forms the staple crop of the area. It contains all the best lands in Berar and supports a large population. The deep rich black soil has been cultivated from time immemorial but the fertility does not seem to deteriorate. Of the total cultivated acreage cotton occupies 45.1% of land in Akola district and 49.9% in Amraoti district, which shows the importance of the crop in the valley. The cities within the valley are all engaged in the cotton trade.

Akola is the first town of the Purna valley in size, with a population of 62,564. The industrial activity centres round the preparation of cotton for the market. There are two large cotton factories, two oil mills, and many small cotton ginning and baling presses. Export of cotton to the Bombay market forms the chief commercial activity. The town of Malkapur trades in cotton. Akot has a large cotton market. Cotton carpets of Akot have a local reputation.

7. The SOUTHERN PLAINS are to the south of the Satpura plateaus. The western part of this physiographic province as far as Nagpur town, is composed of basaltic lavas, covered with lateritic soils. But the plains on the east of Nagpur are covered partly with river alluvium and partly with residual soil. This physiographic province can be divided into seven sub-regions :—(1) Nagpur plain, (2) Wainganga valley, (3) Katangi-Ballahat plain, (4) Sausar upland plain, (5) Arvi upland plain, (6) Wardha plains and (7) Chanda plain.

The Nagpur Plain rises to an altitude of about 1,000 ft. and extends from the Pilakpur hills in the neighbourhood of Katol on the

west to the Ballahi hills on the east. Small flat-topped buttes, like that of Sitabaldi in Nagpur city, break the monotony of this level tract. Practically the whole of the plain is drained by the Kanhans and its main tributary, the Pench.

The town of Nagpur stands upon the eastern edge of the lava plain. Nagpur is the administrative centre of C. P. The city shows the characteristics of a growing metropolis. In this city the commercial, industrial and administrative functions of the province have integrated to a considerable degree. The city stands on a small stream, the Nag. To the east and south-east the city overlooks the expanse of open plains. The railways connect Nagpur with Bombay and thus have opened up the Nagpur plains for the export of cotton to the Lancashire market. The trade in cotton is the real foundation of the prosperity of Nagpur. The exploitation of the Manganese ores and marble in the neighbourhood of the city form the second major base for its prosperity. The Manganese ores are sent to Bombay which exports them to overseas market. Nagpur has thus developed wide regional contacts. It is also an important export centre of timber of the Satpuras, mainly teak, sal and satin wood. Today it boasts of ten large industrial establishments. It is also an active distributing centre of oranges. It is an important railway junction, one line linking it up with Hoshangabad in the north across the Satpuras via the important town of Betul; the second system linking it up with the towns of the Purna valley; the third leads to the south via Wardha; and the fourth important system leads to the east linking it up with Rajpur, Bilaspur and Raigarh. There are branch lines as well leading to Chhindwara, Umrer, and other towns. Thus Nagpur to-day forms the *hub* of some of the important railway communications in the centre of India. This fact in itself emphasises the regional dominance of the city in this part of India.

The Wainganga Valley is situated to the east of the Nagpur plain. Its maximum width is about half a mile. The main valley and the tributary valleys are studded with large artificial lakes, which were constructed in the past for irrigation. Hence this tract is known as 'the lake region' of the Central Provinces. Bhanadra stands on the right bank of the Wainganga, a few miles up its confluence with the Kanhan. It is an old fort town. Handicraft trade in brassworking and cotton weaving is declining. Rice is the main crop of the area. The neighbouring forests yield valuable timber.

The Katangi-Balaghat Alluvial Plain occurs in the north-east of the Ambagarh hills, and extends from the Bawanthari valley to that of the Wainganga. It is fringed on the north by the foothills of the Satpura range and slopes to the east. The eastern part contains deep black soil, and hence is more intensively cultivated and thickly populated. The rocks in the neighbourhood of the town of Balaghat are conspicuous for their development of iron ores, and also contain copper and lead ores.

The Sausar Upland Plain lies to the north of the Nagpur plain and extends up to the foot of the Satpura hills. The surface is undulating with an elevation of 1,100 ft. Here the thin brown soil needs manuring and will then produce excellent crops of cotton and millets. It is watered by a number of perennial streams including the Kanhan. The plain is mainly formed of lavas. The towns, Sausar and Malegaon stand on the eastern edge.

The Arvi Upland Plain extends from the Nagpur plain on the east to the Wardha valley on the west. It is composed entirely of lava flows and has been much dissected. A greater part of this tract is unculturable. Cattle are, however, bred in this tract. Timber trees are grown.

The Wardha Plain is the largest physiographic province composed of lavas and a deep layer of black loamy soil in the valleys of the Wardha and Bembla and other smaller streams, which yield good crops of wheat, cotton and linseeds. The town of Wardha dominates the economic activities of the region. It is a very important cotton market. There are many ginning and pressing factories. The Wardha valley coalfields have played no small part in the development of the cotton factories of the region.

To the south of the Wardha plains occurs another lowlying tract—Chandu Plain. The soil here is sandy and infertile.

8. THE BHANDARA-CHANDA HILLS are a forest-clad hilly country separating the southern plains from the south-western rim of the Chattisgarh basin. There are quite a large number of lakes in this area which occupy depressions surrounded by high ground. These storage tanks, and ample surface run-off of water make this region suitable for rice cultivation. It is a distinctly rural area.

9. THE AJANTA PLATEAUS:—From the southern edge of the Purna valley rises slowly yet another plateau province, traversed by the famous Ajanta range. The plateaus are mainly composed of basaltic lavas and contain rich black loamy soil. It was one of the most important agricultural regions of India before the country got involved in the wars of the 18th century. Since then the country is slowly recovering and more land is being brought under the plough every year.

On the shallow water-parting between the Purna system and the Wardha system stands the town of Amraoti. Amraoti has a trade in cotton. It is the principal cotton market in Berar. The railway takes all the cotton of the area to the Bombay market.

10. THE CHATTISGARH BASIN:—The famous Chattisgarh basin has an average elevation of 1,000 ft. on the west and south, and 750 ft. on the east. The basin is drained by the Mahanadi river system. The main river, however, carries very little water except in the rains before it is joined by the Seonath, as its bed is composed mainly of porous sands. It flows close to the eastern

edge of the plain until it leaves it through a narrow gap, a few miles south-east of Raigarh.

The Chattisgarh Basin covers an area of about 10,000 sq. miles. It forms like the Narmada valley and the Purua valley a distinctly progressive zone. Although rural character dominates the plain there are some important urban centres within the valley. The town of Bilaspur stands on the river Arpa and is connected with the main railway net of the country. It is a rapidly growing town having a flourishing trade with Bombay. Mica is mined in the locality. An interesting feature of the handicraft industry is the weaving of tasar silk from the wild silk cocoons of the neighbouring forests. To the east of Bilaspur stands the ancient fort town of Raigarh. The town exports considerable quantities of tasar silk woven in the locality. Raipur is situated on the Kharun and is the most important commercial town of the Chattisgarh basin. It is an ancient town of considerable historical interest. Raipur has a tremendous future if and when the resources of the country are exploited on a planned basis. It can form the site of a possible cement industry. Drug has the ruins of a mud fort of great antiquity and has not grown much. Its future lies in the exploitation of the very plastic white clay that are found in the neighbourhood. Lateritic iron ores are exposed in large quantities, while deposits of valuable iron ores are known to occur. Dhamtari has a population of 14,071, and the linking up of the town with Raipur has opened a new chapter in the history of its development. It now collects the products of the southern part of Chattisgarh basin and also the exports of the northern part of the Bastar region. Lack of communications and inadequate exploitation of the resources of the region are holding up the economic development of the Chattisgarh basin.

11. THE KOREA-CHAND BHAKAR SANDSTONE PLATEAUS rise north of the Pendra upland. First comes the southern plateau with an elevation of about 2,000 ft., to the north of which extends the Sonhat plateau, some 500 ft. higher. Further north lies the Deogarh plateau, the highest in the area. The plateaus contain excellent pastures, which are leased to the cattle breeders of the neighbouring states of Rewa. The forests cannot be fully utilized for want of transport facilities. The area has rich coal and iron deposits. The former have been opened up in recent years.

12. THE SURGUJA BASIN LIES east of the Korea plateau and is a fertile level tract composed mainly of lower Gondwana rocks. This tract contains good pastures, to which cattle from the neighbouring areas are taken every year. The uplands and valley slopes are covered with sal forests, which cannot be utilised for want of good transport. The floor of the basin is more thickly populated where stand most of the villages including Ambikapur, the capital town of the State of Surguja. There are extensive exposed and concealed coal deposits in this area which cannot be properly utilised until this area is connected with other progressive

regions by roads and railways. Because of the absence of the development of economic resources, there are no real towns.

13. THE SOUTH-EASTERN PLATEAUS :—The greater part of this physiographic province in the south is included in the Bastar State. The northern division is a part of the Raipur district and the Kanker State. The two divisions—northern and southern, are separated by a narrow water parting striking east-west in between the Mahanadi and Godavari drainage systems. The Kanker plateau rises to a height of 2,000 ft. and is composed of granitoid gneiss, and is much dissected by the headwaters of the Mahanadi which forms a typical rectangular drainage pattern, controlled by faulting in the rocks. Kanker, the capital town of the State stands on the Dudh and could not develop for want of good roads and railways. To the east of the Kanker plateau lies another still higher and extensive plateau, known as the Kharier-Nawagarh plateau, with an average elevation of 2,500 ft.

To the south of the Kharier-Nawagarh plateau occurs the plateaus of the Bastar and adjoining states.

Further south lies the Chitrakot plateau with an average elevation of 1,800 ft. The plateau is covered by sandy loam, well suited for rice cultivation, provided there is a good supply of water.

West of the Chitrakot plateau, the ground rises and forms a much more rugged country. The Indravati cuts across the hills through a gorge. This is the favourite country of the Gonds, and known as the Ambujmar track. The rocks are sandstones and shales, similar to those of the Aravalli mountains. The radial drainage pattern of this area is very conspicuous.

The greater part of the plateau just described contain valuable timber trees—sal and teak, which can be better utilized with the development of roads and improvement of marketing facilities.

Many other tribes are also found in these regions. The people present a rather wider pattern as during the many centuries gone by waves of immigration flowed into the province from all sides. The earlier inhabitants were driven into the hills and the forests. The main divisions of the settlers are indicated by the language division of the province. The north-east part of the province is inhabited by Hindi-speaking people who came from the north. Marathas (speaking marathi) are found in Berar, and in the Central and Western part of the province. Gondi is spoken by the tribes. The tribe are gradually being absorbed into Hinduism. The people are predominantly agricultural. The second most important occupation is the exploitation of minerals.

A mention has already been made of the chief towns of the province. Nagpur, the capital, and Jabulpore, a very important railway junction, are the most important towns.

MADRAS

The Madras Presidency has an area of about 124,363 square miles (excluding the States), and a population of 49,342,000. The chief states of Travancore, Cochin and others are now directly under the Government of India. The province is second in area amongst the Indian provinces and it is bigger than Belgium, England and Wales, Great Britain, Prussia and Italy. It has a total coastline of 1,700 miles—1,250 miles along the Bay of Bengal and 450 miles along the Arabian Sea. The entire province lies south of the river Kistna and Tungabhadra. On the east it is traversed by a mountain range of the Eastern Ghats dividing the province into a coastal plain extending from Ganjam to Cape Camorin. The Western Ghats descend along the western coast (called the Malabar coast), right down to the Cape, reaching a height of more than 8,500 feet in the Nilgiris-Darabetta Peak.

The Rivers Kistna, Godawari, North Pennor, Palor, South Pennor and Cauwari—most of which flow from west to east, drain rather irrigate the country. It is only in the delta regions of these rivers (chiefly Kistna, Godawari and Cauwari) that extensive irrigational schemes have been introduced.

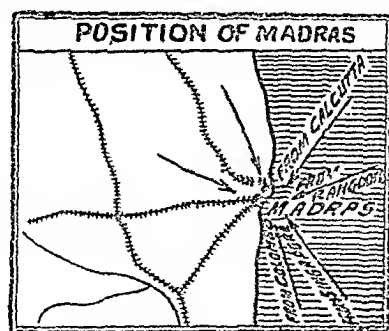


Fig. 70

The proximity of the sea has rendered the climate free from extremes. The rainfall on the western coast and on the slopes of the western ghats is heavy but as we cross over to the east, it lowers down considerably and comes mostly during winter months from the retreating monsoons. In the central table-land on the east coast, rainfall is small and heat during summer months quite excessive. Rice, millets, *ragi* and pulses are the principal crops of this province. Cotton is grown in Tinnevely, Coimbatore, and Belleary. Tobacco is grown in Madura and Coimbatore. Coffee is also largely grown in this province and also in the States of Mysore, Travancore, and Cochin. Rubber is grown principally in Travancore, and Cochin. Agriculture is the principal means of livelihood of the province. Irrigation has been successfully and profitably carried on in the

Climatically this region is quite different from the rest of India as it receives most of its rainfall during October, November, and December from the North East Monsoon. During the season of South West Monsoon, the region lies in the rain-shadow of the Nilgiri and Andaman hills. The average rainfall is about 30 to 35 inches annually. In the eastern plains, therefore, irrigation is a dire necessity and canal irrigation is largely carried on there, the Perijer Project the Cauveri Delta system and the Poini, Palor and Cheyyor systems deserve special mention as they have conferred a boon on the region.

About 73 per cent of the total area is cultivable but only 48 per cent is actually cultivated, the largest percentage lying in the coastal plain region. About 42 per cent of the cultivated area is irrigated. Rice is the chief crop and occupies about 35 per cent of the total cultivated area. It is grown mostly on the flat lands of the eastern plains. Millet comes next and occupies the drier regions specially in the centre and west. Pulses, ground nuts and cotton also occupy respectable percentages. Cotton is important in Trichonopoly, Madura and Tinnevelly where black cotton soil is the chief factor. Tobacco is important in Madura and Trichonopoly. *Beers* and *cheeroots* are manufactured in these centres and are famous all over. Tea is grown on the slopes of the Nilgiri hills. In the matter of mineral wealth the region is poor. Some deposits of graphite and black lead occur in Tinnevelly. Some mica is mined in Nellore. Much salt is obtained from sea-water on the coasts. Pearl fishing and fishing are important industries.

In the matter of density of population, the figures stand very high-463. It is much higher in the eastern plains. The region has very old migratory traditions. There are three main streams of emigration from this region. People migrate temporarily to the tea and rubber plantations in Coimbatore and Nilgiris. The second movement is to Burma and Ceylon and the third to Malaya. Emigration is heavy from the districts where irrigation facilities are low, the chief areas are Tanjore, Trichonopoly, and Tinnevelly.

As in the Northern half there are no natural harbours in this region also, although some small ports do exist. (Pondicherry, Cuddalore and Tuticorin may be mentioned) Madras is the largest port of the province and even it does not have a natural harbour. As stated earlier, a new artificial harbour has been added to it. It is also the capital and the biggest town in the province. Madura is another important town. Otacamand, the summer capital may also be mentioned.

3. The Deccan plateau (including the Eastern Ghats) presents the roughest topography in the province. The average altitude ranges from 600-feet to 2000 feet. The surface presents an undulating outlook. The rivers flow through broad valleys. The region as a whole represents an arid piece of land getting below 30" of rainfall. Heaviest rain falls on the slopes of the Ghats.

Tea, rubber and cardamom plantations are flourishing concerns in Travancore. The growth of tea plantations in Travancore can be seen from the following figures.

1920-1924	48,655
1930-1934	73,749
1935-1936	77,585

In 1935-36, in Travancore 6,368 acres were under coffee. The manufacture of coir yarn is also an important industry in Travancore, inasmuch as, out of the 351,076 industrial workers 126,427 or 36 p. c. were employed in this industry in 1931. Out of the total export of Rs. 21.25 crores from the State, in 1930, coir yarn accounted for Rs. 2 crores roughly. In 1939, rubber plantations covered an area of 100,869 acres and the total production during the year was 23,353,760 lbs.

All the minerals in Travancore have not been explored. Plumbago is the only mineral worked to some extent. Mica of superior quality is found in various parts of the country. Graphite also occurs in the State. Vast quantities of Thorium have recently been proved in Travancore.

Travancore receives more immigrants than the immigrants it sends out.

The immigration is mainly to the tea, rubber and cardamom estates in the Highland Division of the State. Two reasons are given for this flow of outside immigrants. Firstly, the Tamil labourers are considered more efficient for plucking tea leaves, and secondly, the tea and cardamom estates of Travancore are inaccessible to the people of the State due to a lack of good communications. A new road has been recently opened which may solve this problem.

Trivendrum, the capital of Travancore, is a modern town with a university. It is also a railway centre. Allepy is an important port.

Cochin is another state much smaller in size than Travancore (only about 1480 square miles in area having a total population of about 1,422,000 persons).

It is situated north of Travancore and both of them are very much alike. Like other areas on the south coast of the Indian peninsula, the State enjoys the benefit of two monsoons, the South-West and the North-East. From the former it gets most of its rainfall. The average rainfall is over 100 inches. One of the most peculiar physical features of Cochin is the line of interconnected lagoons almost skirting the sea shore.

The soil may be divided into two distinct groups (i) The 'red' ferruginous derived from ferruginous stones, laterite and other rocks. (ii) The 'arenaceous' being the flinty sand basis littoral

tracts—improved by manure and the silt of river. "The geological formation of the forest tract is gneiss, which is eminently fitted for luxuriant forest growth."

The chief harvests are (1) *Virappu* (September to October) (2) *Mundakkan* (December to January) carried on with a great deal of transplantation; (3) *Punchal* (March to April) and (4) *Ko'le* (April to June). The last named is peculiar to Cochin, Travancore and Malabar and means the cultivation of paddy in the fresh water lakes after draining away the water. A good *Ko'le* crop often saves the State from the effects of other bad harvests. Leaving the fields fallow is almost unknown, except in the case of *Ko'le* lands.*

The agricultural situation in Cochin can be studied from the following figures.

Agricultural Statistics		
Percentage of Total Area		Percentage of cultivated area
54.20	51.70	63.20

Cochin has good plantations of tea and rubber. The first rubber plantations were started in 1905 on the Pilapilli hills. The acreage under rubber has increased ever since. In 1931 there were seven rubber plantations with an aggregate area of about 10,000 acres. In 1939, 13,710 acres were under rubber and the total production during that year was 3,721,928 lbs.†

There are coffee plantations also. In 1862-1870 about 9,470 acres were leased out for coffee on the Neiliampathi hills. "Most of the coffee is exported, and owing to the want of transport facilities the acreage under cultivation has been decreasing and to-day there are about 6,000 acres under coffee". Tea is displacing coffee to a certain extent. In 1935-36 coffee occupied only 2,072 acres. The acreage under tea has increased greatly, it is now 2,591 acres.

Leather, cotton weaving, coir manufacture and ceramics also exist on a small scale in Cochin. Coconut oil-pressing, once a very flourishing concern in the State, is declining of recent years due to the competition from Ceylon.

Cochin is the capital and the most important port of the state. It was once an important coir port. It is steadily moving towards importance and economic development as an important port and city.

NORTH WEST FRONTIER PROVINCES.

In 1901, the N. W. F. P. was severed from the Punjab. It is 408 miles long and 279 miles broad and the total area amounts to about 39,276 square miles. It is about $\frac{2}{3}$ the size of England and Wales.

*Census Report, Cochin, 1906, p. xxxii.

†Indian Rubber Statistics, 1939.

Politically it consists of the 5 British districts namely Dera Ismail Khan, Hazara, Kohat, Peshawar and Bannu. Besides it consists of a Trans-Frontier Area containing five political agencies Malakaur, Khyber, Kurram, North Waziristan and South Waziristan and also the Tribal Territory.

Geographically the province is a part of the Main Natural Region, the North West Dry Region which sketches southwards beyond the Indus through the Punjab districts of Mianwali, Muzaffargarh and Dera Ghazi Khan and occupies a major portion of Western Punjab. Taken as a whole the province occupies a narrow higher mountainous tract. But one may divide it into 3 geographical regions i.e.

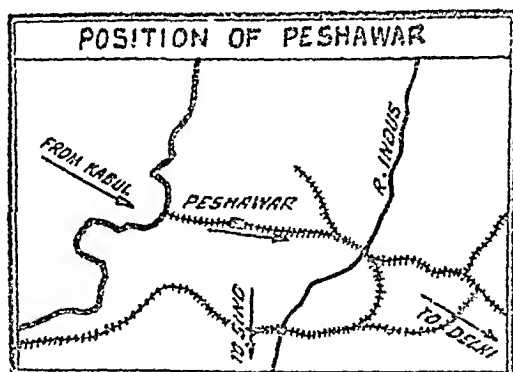
1. The Indus district of Hazara.

2. The narrow strip of plain containing the lowland districts of Peshawar, Mardan, Kohat Bannu and D. I. Khan, and (3) the bigger mountainous tracts of North and North-West and West.

The valley of Peshawar deserves special mention or it is best irrigated and best cultivated. The upper and lower Samat canals and the Kabul ring Canals are the chief irrigational works of the valley.

Wheat is the most important crop specially in the irrigated parts. Millets, barley and maize also occupy appreciable percentage. Hazara is specially important for millets.

Peshawar, the capital, is also the most important town of the province. It has been and is still important for its situation on the Khyber Pass. Its distance from Lahore is 276 miles and from Kabul it is 190 miles. Nearly all the trade between India and



Afghanistan passes through Peshawar. Most of its importance is due to its strategic position and since always it has been a very important military station. Bannu, Kohat and Dera Ismail Khan are also important military as well as trade centres of the province and control the affairs of their respective valleys or plains.

ORISSA

In separating Orissa from the combined province of Bihar and Orissa, the aim kept in view was to make it an area of linguistic units as it is to-day. Orissa is the name given to the whole country where the main language of the people is Oriya. The following areas having Oriya speaking people, have been combined to form the new province (From 1st April, 1936). Orissa division of the former province of Bihar and Orissa, (2) the Ganjam district of Madras. (3) Portions of Central provinces, Kharian, Raipur and Chandhapur. The new province has an area of about 32,000 square miles and a population of 11,754,000. Orissa is a backward province both in the matter of agriculture and industries, although its natural and mineral resources are not so bad.



Physically it is a heterogeneous region as it has two district subdivisions (1) the plains comprising mainly of the valley of the Mahanadi and its tributaries and (2) the interior hilly region. The Northern portion of the coastal plain is unproductive. The central zone is a fertile alluvial plain having many deltaic formations. Towards the west land tends to rise.

The climate is free from extremes, the maximum and minimum temperatures being 82°F and 68°F respectively. The average rainfall ranges between 45 and 55 inches annually.

It is well watered by the Mahanadi, its tributaries and their canals. Cuttack district enjoys an extensive system of irrigation. Balasore and Puri having a smaller space, intervening between the hills and the coast, are for the most part dependent solely on the rainfall. The south of Balasore has some irrigation.

Orissa is peculiarly liable to disastrous river-floods, which spread death and destruction. To control such calamities embankments to the rivers have been constructed. But sometimes these embankments prove mischievous, instead of useful. In their downward course the channels become gradually small capable of passing a small part of the water during floods. Hence escapes like safety-valves are necessary here. The constructed embankments by closing these safety-valves increase the danger of inundation.*

Agriculture is the main industry. The following figures are useful.

Agricultural Statistics

Year	Percentage of Total Area		Percentage of cultivable area		Percentage of cultivated area irrigated
	Cultivable	Cultivated	Cultivated	Double cropped	
1911	70.3	55.5	78.3	9.2	18.6
1921	73.2	53.8	73.5	6.5	19.4
1931	73.2	53.6	73.3	4.5	16.2

Rice is the chief crop and occupies about 80% of the total cultivated area. Other crops are jute, pulses and sugarcane.

Turmeric is extensively cultivated. Small industries like handloom industries, *endi* and *tussore*, and silversmithy are very common, which have reached a high degree of skill and efficiency. The chief mineral products are iron, limestone, manganese and mica; 60% of India's iron ore come from Mayurbhanj, Bonai, and Keonjar, Feudatory States of Orissa. Coal-mines are found in Amjil, Sambalpur, Gangpur, Talcher, and Athmalik. The number of factories in 1937-38 was 72 with 34,802 hands including seasonal workers. Chilka and Puri export 9,000 mds. of cured fish and 50,400 mds. of fresh fish to Calcutta every year-fishing being an important industry in Orissa. A large area is covered with forests producing a considerable quantity of timber. Hides and skins form another minor industry. In 1937-38 the province had 1,458 miles of roads, of which about a thousand miles were metalled. The total mileage of railway in the province is only a little over 500 miles. The construction of Vizagapatam harbour has given a stimulus to the foreign trade of the province. The people are mostly rural and majority of them are Hindus. The number of towns is small.

Cuttack is the old capital and near it a new sight has been selected for the construction of the new capital. It is situated on the delta of the Mahanadi and is an important trading centre famous for its gold, silver and ivory industries. Puri is another important town and port. It is also a place of pilgrimage for the Hindus. Fishing is an important industry.

*W. A. Inglis. "River Floods considered as a Problem of Indian Administration." The Asiatic Review, October 1926.

PUNJAB

this season, although it gets the advantage of both the Arabian Sea Branch and the Bay of Bengal Branches of monsoon. In the winters rainfall comes from the North-West. This is due to cold weather disturbances, but their force decreases as they reach the Gangetic valley. These depressions advance from the West, coming over Iran and Afghanistan into N. W. India. Their exact origin disputed. Some have close association with the Mediterranean Sea, other are probably secondaries, and are associated with the same types of weather. The rainfall on the hill slopes (places like Dharamsala and Dalhousie) get quite heavy rainfall above 80" and are covered by forests having oak and *Dendur*. On the other hand there are places in south and west where rainfall is over below 10".

It is therefore evident that in a very large part of the area, irrigation is an absolute necessity, without which agriculture becomes uncertain and poor. A detailed account of the important canal systems has already been given in the chapter on irrigation. Hence it is only necessary to give a brief outline. About 16.5 million acres of land are under canal irrigation. There are more than 2,810 miles of Government canals and about 15,000 miles of distributaries. The largest irrigation works are :—

- (1) The Sutlej valley canals irrigating about 1.5 million acres
- (2) The Lower Chenab canal irrigating about 2.3 million acres (3) The Upper Bari Doab canal irrigating about 1.2 million acres (4) The Sirhind canal irrigating about 1.79 million acres. (5) The Western Jumna canal irrigating about 0.8 million acres (6) The Haveli Project irrigating about 7.0 lakh acres. Besides there are about 3,32,182 wells irrigating about 43,46,200 acres.

Taking the Punjab as a whole, the land utilization figures* are :—

Total Area	61,001.6	thousands of acres.
Cultivable	30,992.6	" " "
Waste	37,186.8	" " "
Forests	1,975.2	" " "

About 33 percent of the cultivated area is under wheat. Cotton is the most important summer crop. The following table gives crop acreages for the province.

Rice	...	951,181
Wheat	...	9,884,202
Barley	...	799,299
Jowar	...	876,538
Bajra	...	3,862,825
Maize	...	1,144,402
Grain	...	3,450,144
Oil seeds	...	1,481,456
Sugar	...	549,173
Cotton	...	2,668,844
Fibres	...	2,717,437
Tobacco	...	60,599
Fodder	...	5,215,941

*Mention must be made of the admirable articles on the Agriculture of the Punjab by Dr. Kazi Saeed uddin-Ahmad, published from time to time.

Wheat. Wheat is an important crop not only because of the export trade but also because it is the staple food of a large part of the population. But the quantity of wheat exported is only that which is in excess of the requirements of the population. The yield varies in different localities, being 5 to 10 maunds in unirrigated lands and 5 to 25 maunds per acre in irrigated lands. Harvesting time for wheat begins in April and sowing is done in October and November. Wheat is grown all over the province in considerable quantities except the Ambala Division and the Ferozepur District. The Districts of Lyallpur, Gurdaspur, Montgomery, Jullundur and Multan deserve special mention.

Barley. Among winter crops barley comes next to wheat. This is a food grain grown on soils which are inferior in composition and moisture. This is a coarser grain which is more hardy than wheat. This is grown mostly in Hissar, Gurgaon and Ferozepur Districts. The important use made of barley is for brewing and malting.

Gram. It is a winter crop and holds a prominent position among the pulses. It is cultivated in unirrigated lands and therefore is dependant on rainfall. It is cultivated in considerable quantities in the districts of Ferozepore, Hissar and Ludhiana.

Rice. This is a summer crop requiring special conditions for its cultivation. It can be grown in hot climate with plenty of water supply and moisture. The sub-montane districts of the Panjab are specially favourable for its growth. The districts of Hoshiarpur, Kangra, Simla and Gurdaspur are among the important producers.

Cotton. This is an important commercial crop which occupies a prominent position in export trade. The variety of cotton grown was mostly short staple (Desi) but in recent years long staple (American) variety has become more popular because of the high value that it fetches. Cultivation of cotton is possible only in irrigated lands.

Cotton requires hot moist climate for sowing, moderate rainfall during summer months and dry autumn at the time of picking. It is grown in large quantities in the canal colony districts of Shahpur, Montgomery, Multan, Lyallpur and Sheikhupura.

Sugar-cane. This is a crop the possibilities of which were not properly appreciated till recently. India used to depend on imported supplies of sugar. Plenty of water supply is necessary for its growth.

Its cultivation demands a good deal of the time and attention of the cultivator. However, its value adequately compensates him for the trouble involved. Among the sugar growing provinces, Panjab stands second to U. P.

Sugar-cane is sown in March and harvested in the winter months of January and February. It flourishes in hot climate having sufficient

Most of the sugar-cane is now used in the manufacture of sugar by sugar factories which have been established in different parts of the province. Before this *gur* was made out of the sugar-cane juice.

Oil seeds. They form another important crop. We export oil seeds in large quantities ; important oil seeds being linseed, til, castor-seed, rape-seed, etc.

Tea. This is grown in the Kangra valley at the foot of the hills. It requires warm and damp climate with abundant rainfall which should be drained off. The quality of the tea grown is not as good as that grown in other parts of India.

Vegetables. Vegetables such as carrots, turnips and potatoes are now grown extensively, particularly near the centres of population.

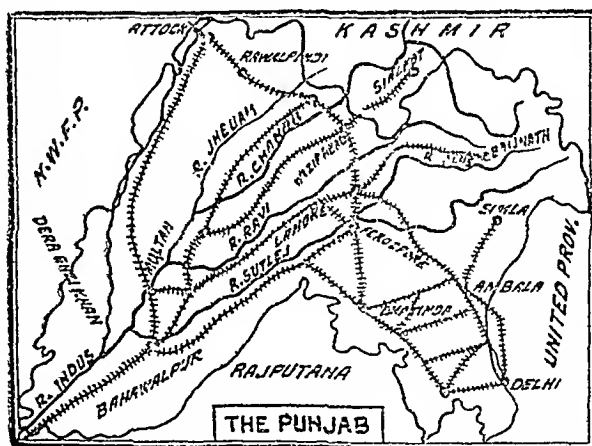


Fig. 73.

Potato is a very profitable crop which has come to the forefront in recent years.

*Fruit Industry.** About 76,000 acres are devoted to fruit cultivation in the whole province; this shows an increase of about 30,000 acres during the last 15 to 20 years. This rapid expansion is due largely to the opening of a number of fruit factories in the various towns. The Punjab produces the largest quantity of fruit in India, having a close second in U. P. At present only mangoes are exported. The province may be divided into the following fruit zones.

(a) The cool climate region (Kangra, Simla, Kullu and Murree) has mild summers and severe winters. Pears, peaches, apples and apricots thrive here. In higher regions there are gardens of litchis and strawberries.

(b) The dry Salt Range region with its extreme climate is important for hardy fruit like almond and plums.

(c) The Punjab Plains are rather dry but have good irrigational facilities. With greater extremes of climate in the west and south-west, tropical and sub-tropical fruits like grapes, mangoes, cherries, dates and lokats thrive.

After a general survey of agriculture in the province it seems useful to divide the Punjab into agricultural regions. Dr. Saeeduddin Ahmad who has made a detailed study of the agriculture of the province, is the first to sponsor such a division from a geographical point of view. And we have followed his divisions here.

He divides it into seven regions :—

1. North-East Region.
2. North-West Patwar plain.
3. North-East sub-montaine Region.
4. East central plains.
5. West central plains (Colony Region)
6. South-East Plain.
7. Western Plains.

1. The North-East Region consists of the districts of Kangra and Simla and a narrow hilly strip of Ambala, Hoshiarpur and Gurdaspur. The rainfall is reliable and abundant, about 45.9", variability being less than 12%. Terracing and preparing the land for cultivation is rather expensive. Hence sheep rearing is a more commonly followed occupation. Agricultural holdings, specially in

*Fruit Industry in the Punjab by Farhat Ullab Khan, The Punjab Geographical Review-Vol I 1942 is a good contribution and has been used.

† Agricultural regions of the Punjab-Kazi S. Ahmad, The Punjab Geographical Review. Vol. I, 1942.

Kangra and Simla, are smallest in the province (2.5 acres). Wheat, maize, rice and pulses and barley are the chief crops. Kangra grows all the tea in the Punjab. Fruit growing offers another possibility. Not many people live in this region and settlement is characterised by isolated cottages and scattered hamlets.

2. The North-West Potwar Plain lies north of the salt range and includes the districts of Rawalpindi, Attock and Jhelum. The plateau is an undulating country broken by hills and consists of woodlands bearing traces of former glaciation. The soil is light loam. The loam here is shallow and the summer crops are liable to be burnt up. Rainfall varies from 21" in Attock and Jhelum to 31", in Rawalpindi, the winter and spring precipitation being heavier. Irrigational facilities are at the very lowest. Holdings are fairly large, being 5 acres to 10 acres. Wheat and bajra occupy 60 per cent of the cultivated area. Other crops include pulses, maize and gram. Vegetables are also produced.

3. The North-East Sub-montane Region includes Ambala, Hoshiarpur, Gurdaspur and also the districts of Sialkot, Jullundur, Ludhiana and a part of Gujrat. The region stretches in a long strip along the Himalayas. The rainfall is high as well as quite reliable. As a rule the rainfall decreases towards the north-west and south-west. The sub-soil water level being high it is easy to dig wells. Wheat, maize, sugar-cane and fodder occupy about 7% of the cultivated area. The population is the densest in the Punjab and the holdings are correspondingly smaller (2.5 acres)

During the monsoon months the climate becomes unhealthy and damp. Rajputs are the predominant tribe. In parts of Ambala and Hoshiarpur much fertile soil has been lost because of erosion.

4. The East Central Plain. This plain consists of old settled districts from Jamna to Jhelum including Karnal, Ferozepore, Lahore, Amritsar, Sheikhpura, Gujranwala and a portion of Gujrat. This region also is very thickly populated. There is a great pressure on the soil and the holdings are unusually small though as a rule larger than in North-East submarine region. Both canal and well irrigation are developed and mitigate largely the effects of low rainfall. The rainfall besides being low is also very variable. Wheat is the principal rabi crop and cotton forms an important kharif crop. Some rice is grown in the western portion while gram is grown in the eastern portion. Vegetable gardening is on the increase near the towns. There is an elaborate network of railways and roads and the area has within it two important mandis of Lahore and Amritsar.

In this area we come across a well organised village community and the land is held by small land-holders because since the days of the Moghals big zamindars and Taluqadars have not been allowed to flourish.

5. The colony region or W.C. Plain. This is agriculturally the most progressive area of the province and consists of Montgomery, Lyallpur and a major portion of Jhang. Here agriculture has taken definite shape of agriculture farming. Until about forty years ago this region was almost valueless agriculturally owing to a lack of rainfall. Situated between large rivers the area has now been irrigated by canals most of which are permanent. A large number of wells supplement the canal water where necessary. The former Government waste lands have been colonized by actual agriculturists who have migrated from more crowded areas. They have been settled on rectangles of land varying from 25-27 acres of area and carefully planned villages have been built. The holdings are large and compact which lead to great efficiency in agriculture. Improved machinery is in use. Leading crops are wheat, American cotton and fodder. There is a considerable surplus for export. The region is well supplied with markets which are connected with villages by roads and railways. The region as a whole presents a prosperous, well developed and illuminated agricultural community.

6. The S. E. Plain. It is situated between the Jamna and the Sutlej and comprises the districts of Rohtak, Gurgaon and Hissar. This region is largely devoted to dry farming. Only a small portion of this region is irrigated. Canals and wells are difficult to construct owing to the water table. The main problem of the area is to provide hardy crops and hardy varieties of popular crops. Special attention is paid to cattle breeding and the region is well noted for its excellent breeds of cattle. Bajra and fodder in summer and gram along with coarser varieties of wheat are the principal crops of the region. Barley is grown largely in the district of Gurgaon. The region is not densely populated and the holdings are as a result large—the average being 7.5 to 10 acres. In more fortunate years there is usually a large surplus of grain but unfortunately such years are once in five years. There is always a danger of famine and life is a constant struggle with nature. On the east the region is akin to U. P. and in the south to Rajputana. In the north one comes across widespread sand dunes and a large number of camels are employed both in the fields and on the roads.

(7) Western Plains. This region comprises of the districts of Mianwali, parts of Shahpur, Jhang, Muzaffar Garh and Dera Ghazi Khan. It is the poorest and the most backward region of the province. Here the people live in the old pastoral state and still retain their nomadic habits. One comes across tribes under Pirs and religious groups. The relief of the region is rather trying. Soil is sandy and infertile. In summer it is one of the hottest regions of the north and the rainfall is very scanty and unreliable. (below 10", variability 50. % to 60 %). The land is divided amongst big landlords who are

extravagant except in the matter of their fields. One comes across the extremes in the matter of the size of the holdings. The small holdings are too small to support, its holders. The region is as a whole very thinly populated but compared with the poverty of the land the population is much more than can be supported.

Agriculture is very precarious and is confined to the places near the rivers or near the inundation canals. There are also tiny patches of cultivation near the wells. These wells* are also poor in the supply of water especially when they get away from the rivers. Wheat and gram are grown in winter, Jawar and Bajra in summer. Large quantities of dates are produced. In a large part of the area many people live on dates for many months and at many places the date stones are ground into flour. An important characteristic of the region is that on account of poor yields subsidiary means of livelihood are important. Cattle and horse breeding are quite paying occupations. Pastoral farming is also followed by nearly all the farmers. Villages are few and far between and the means of communication are backward. Very few railways cross the Indus to the west and metalled roads are also rare. Only kucha roads and tracks connect the various villages.

FORESTS :—

The area under forests was 6·7 per cent. of the total areas of the Province in 1937-38. These are mostly to be found in the hilly tracts. Due to the lack of means of transport full economic benefit can not be derived from them. With the extension of railways and roads a greater exploitation of the commercial possibilities of the forests is bound to come. At the present extraction from forests usually takes the form of floating timber down the rivers from the hills to the plains. It is in this way that the well known timber markets at Lahore, Wazirabad, Jhelum and Jagadhri have sprung up.

Variations in the climatic conditions, the quantity of rainfall and altitude, give rise to the different types of forests. As the province is situated far away from the sea, it is not within an easy reach of the monsoons; the annual rainfall in the central districts is about 20 inches. In the south western districts the rainfall is even less and seldom exceeds 10 inches. The climate is extremely hot in summer and very cold in winter. Thus in districts such as Ferozepore where rainfall is scanty only such trees are to be found as can retain moisture, e. g., Kekar, Jand and other prickly shrubs, which form very valuable fuel. The northern plains, even though better off in respect of rainfall, are without forests as these have had to be cleared up under the pressure of population.

On the southern slopes of the Himalayas where rainfall is plenty and altitude higher, we have the thick forest lands around

* A five-year scheme costing about two crore rupees, of sinking wells in the province is under consideration of the Government.

Simla, Kangra, Kulu and Hoshiarpur. Then there are the north-western hills around Rawalpindi and Jhelum with comparatively low altitude and smaller rainfalls where the vegetation is less luxuriant :—

The forests of the Punjab may be classified under two heads :—

(a) Hill forests, and (b) forests in the Plains.

The former type are found in the hilly areas and the latter in the sub-montaine tracts and along the banks of rivers and canals. The hill forests supply valuable wood used for construction purposes and as fuel, e. g. fir, pine and walnut. The forests in the plains are the suppliers of shisham and mulberry wood which is used for the manufacture of furniture and sports goods.

The development of irrigation facilities has led to the coming into existence of rich forest plantation e. g., the one at Changa Manga, 40 miles away from Lahore ; the other at Chichawatni, in the Montgomery district, and the third at Khanewal, in the Multan District. The mulberry trees grown in the Changa Manga plantation supply raw materials for the flourishing sports industry at Sialkot.

There are also two other smaller plantations, one at Kot Lakhpat and the other at Hoshiarpur, not very far from Lahore.

Apart from the ordinary uses of forests such as the supplying of timber and fuel wood and providing grazing grounds for the cattle, the Punjab forests have a great indirect value in so far as they provide raw material for some of the important industries. The sports goods industry at Sialkot which uses mulberry wood has been referred to elsewhere. In addition there are other industries which deserve mention ; match manufacturing industry at Shahdara and the furniture industry at Kartarpur and Gujrat which make use of shisham wood in large quantities ; the resin industry at Jallo which gets its raw materials from pine trees and makes useful articles like boot polish, varnishes ; the paper industry at Jagadhri gets its pulp from the forests. All these industries would not have come into being without the existence of forests.

Water-Power in the Punjab.—In a province like the Punjab, where hardly any coal is obtainable, the importance of alternative sources of power cannot be exaggerated. Fortunately, the province is favourably situated regarding the development of water power, because it has a large number of streams and rivulets in the hills which keep flowing throughout the year. Already there is a Hydro-Electric Scheme in operation at Jogindar Nagar in the Mandi State. The water of the Uhl river has been utilised for producing power by diverting it through a tunnel, about two miles long, and then dropping it down about 1800 feet below by means of steel pipes.

This started working in March, 1933, and is supplying electric current to a number of important towns in the province. The scheme has only been completed in part. When it reaches its full development it should be able to supply cheap and adequate power not only for domestic purposes but also for the development of industries and agriculture.

Mineral Resources of the Punjab: The province is not very favourably situated as regards its mineral resources. The following minerals are found in limited quantities mostly in the hilly tracts.

Coal. It is had at several places in the province. The largest output, however, comes from the Salt Range at Dandot (Jhelum district) where mines have been worked for the North-Western Railway. The Dandot mines have a fluctuating output which comes to about 50,000 tons annually. Other places of minor importance are Bhaganwala and Tejawala in the Shahpur District and Makarwal in the Mianwali District. The total quantity produced is by no means sufficient to meet the requirements of the province and large quantities have to be imported from Bengal.

Iron. Iron is found in very small quantities in the Kangra District, at Chahrat in the Attock District and in some of the Hill States. These mines cannot be worked profitably on account of coal not being available in the vicinity of the mines. The quantity actually obtained, therefore, remains negligible.

Salt. This is an important mineral of the province. Most of it is obtained from the Salt Range at Kewra and Kala Bagh. Some salt is also obtained from the brackish water at Farrakhabad in Gurgaon District. A small quantity is obtained from open quarries in the Mandi State.

Petroleum. This is found in considerable quantities at Khaur and Dhulian in the Attock District. The supply, however, is not enough for the requirements of the province and it depends on imported supplies. The oil obtained from the wells at Khore is carried through a pipe-line to Rawalpindi where a refinery has been set up.

Gold. This is obtained in very nominal quantities from the gravel of the Indus and some other rivers by means of washing—alluvial gold.

Slate. Good quality slate is obtainable from Kangra Valley near Dharamsala and at Rewari in the Gurgaon District. The use of the slates in the province, however, is not made on extensive scale, because of the difficulties of transport and the availability of cheap cement tiles almost everywhere.

Salt petre. This is produced in different parts of the province and is used in the manufacture of gun powder. Important centres of its production are Okara (Montgomery) and Bhera (Shahpur).

Limestone, Cement, etc. Lime for making mortar is obtained by burning limestone. This is used as a binding material. Large deposits of limestone are found in the North-Western districts of the province. The impure limestone, known as "Kankar" forms a raw material for the manufacture of cement. We have a big cement factory at Wah in the Attock District.

Clays. The well-known place in the province for a special kind of clay known as "Multani Matti" is the Multan District. Multani Matti which is edible is also used for medicinal purposes.

Alum. It is manufactured in the Mianwali District and the output ranges from 200 to 300 tons per year.

Industries of the Punjab. We may now give a brief description of the principal large-scale industries existing in the Punjab.

Textile Industry. "Of the principal manufacturing industries now existing in the Punjab the cotton industry is the largest." It employs the largest number of workers and produces goods of maximum value. Cotton textile mills are established at Ludhiana, Lahore, Amritsar, Montgomery, Okara and Lyallpur. Their total production amounts to about 33 million yards annually.

The Punjab is the largest producer of cotton but her industry consumes only 12½ per cent. of the total production. There is therefore considerable scope for the expansion of this industry.

Cotton Ginning and Pressing. Factories for cotton ginning and pressing are established in the cotton-growing tracts of the province and therefore they are found at Amritsar, Lahore, Lyallpur, Okara, Montgomery, Sangla, Sargodha, Khanewal, Moga, and Ludhiana. The number of such mills will automatically increase with the expansion of cotton growing.

Woollen Goods. The Punjab produces the largest quantities of raw wool and exports about 11 million pounds to other provinces and foreign countries. The quality is rather inferior and, therefore, better quality wool has to be imported. There is a considerable scope for improving the quality and for the expansion of the industry curtailed especially now that foreign supplies of woollen goods have been. We are the largest consumer of woollen goods and thus the market is already there. It is, therefore, time that the Dhariwal Woollen Mills should have more rivals in the field. A suggestion has already been made for establishing a Government factory at Fazilka or Amritsar, both of which are wool centres of the Province.

Hosiery. This industry is of recent origin and is making a satisfactory progress. It has a bright future and large scope for development because of the abundance of raw materials and market for the consumption of its products. At present it is exclusively confined to Ludhiana, though factories at other places, e.g., Amritsar, Lahore, etc., are being established.

Sugar Industry. Several sugar manufacturing factories of the modern type have been set up within the province at various places e.g., Abdullapur in Ambala District, Phagwara in Kapurthala State, Sonapat, Amritsar, Gujranwala, etc. But for the Central Government's policy, the industry would have made considerable progress during these years, because raw materials can be easily produced in the Province.

Resin and Turpentine. The manufacture of these articles is carried on mainly at Jallo, where a Government factory has been established for this purpose. This industry could also be expanded.

Cement Industry. With the economic development of the Province this industry is likely to make rapid progress. At present it is at Wah (Attock district) that the biggest factory is situated. Another factory has been recently established at Dandot (Jhelum district).

Cottage Industries form an important part of our economic life. Certain areas have come to be associated with certain articles. The following cottage industries are to be found in different parts of the Province :—

(a) Handloom weaving. (b) Carpet weaving. (c) Hosiery. (d) Iron and metal works. (e) Cutlery and surgical instruments. (f) Pottery. (g) Sports. (h) Ivory goods. (i) Tanning. (j) Wool-work.

Handloom weaving is an industry of long-standing, which at one time was in a flourishing state. But the competition with the machine-made goods exposed it to a serious danger. The industry would have died out completely if it had not adapted itself to the changed conditions by making use of imported yarn. The industry is widely distributed over different parts of the Province and different areas have come to specialise in the production of different articles. For example, Rohtak specialises in the manufacture of turbans. The districts of Multan, Montgomery, and Jhang are well-known for the bed-spreads (Khes). *Durries* are associated with the districts of Ambala and Lahore. Gujrat, Ludhiana and Hoshiarpur turn out dress material made from artificial silk in larger quantities.

Shawls of fine quality are made out of wool at Amritsar, Ludhiana and Gujrat, wool being imported from Kulu and Kashmir.

Silk material is manufactured at Amritsar, Jullundur and Batala. The yarn used is partly of home origin and partly imported. Silk manufactures of these areas command a wide market all over India and enjoy a high reputation for quality and design.

Carpets. Woollen carpets are manufactured at Multan and Amritsar. On account of the establishment of big factories at

Amritsar the cottage industry has fallen into insignificance. Amritsar carpets are exported to foreign countries, particularly to U. S. A., in large numbers.

Hosiery. In recent years hosiery has come to occupy an important position. This is due to the growing demand for its products like socks, stockings, pull-overs, underwears, etc. The use of cheap and simple machinery imported from Japan is a special feature of this industry. Important centres are Ludhiana, Lahore and Amritsar.

Iron and metal works. Although the Province has to get its raw-materials from distant parts, the industry has established itself in different centres; Jullundur and Batala have become well known for the manufacture of agricultural equipment like sugar-cane crushers, fodder chopping machines, ploughs, etc. Sialkot, Jullundur and Amritsar are manufacturing iron and steel boxes in considerable quantities.

Copper and brass ware in the form of household utensils are made at Gujranwala, Jagadhari, Amritsar and Jullundur.

The manufacture of cutlery and surgical instruments has also been taken up in recent times. The industry has been gaining ground on account of the installation of chromium plating plant. Important centres are Sialkot, Wazirabad, Bhera and Lahore.

Pottery. Earthenware are widely used by the poor people. Every village has a potter to supply its requirements. But the Districts of Multan and Gujrat have come to specialise in the production of glazed earthenware of artistic finish. This industry is not doing well now because of the cheap glass and China wares having become available.

In this connection mention may also be made of the cement tiles which are being manufactured in important centres like Lahore, Amritsar, Rawalpindi, Pathankot, etc., on account of the increasing use being made of these for flooring purposes.

Sports goods. This is an industry which has dug its roots deep in Sialkot. The labour having become skilled and specialised has given the industry a peculiar advantage. Sports goods made in the Punjab not only supply the market all over India but also in a number of foreign countries. The industry is in a flourishing state and has been able to hold its own against foreign competition.

Ivory goods. Multan, Bhera and Amritsar are the important centres. Articles manufactured are combs, beads, buttons, toys, etc. Internal demand for these articles is very small. They are bought mostly by the rich people or by the foreigners.

Tanning. A certain amount of tanning in the old and primitive manner has always been done for the manufacture of country shoes,

saddles, etc. But with the coming in of modern methods, it is losing its importance. Wazirabad, Sialkot, Mianwali and Attock are still doing a certain amount of tanning.

Wood-work. This industry may be split up under two heads: Firstly, the manufacture of furniture for which important centres are Gujrat and Kartarpur (Jullundur district). They produce cheap furniture made from Shisham wood, which is sent out to different parts of the Province.

Secondly, we have the wooden toys and other small articles like jewellery boxes, lamp stands, vases, etc., being made out of wood and printed in artistic designs. Well-known centres for this are Hoshiarpur, Pakpattan (Montgomery), and Sabiwal, (Shahpur).

Miscellaneous. Other minor industries are chick making, basket-making, rope-making, etc., found practically in all parts of the Province. Soap making at Amritsar and Sargodha, chalkpencils and crayons at Gujranwala, and hand-made paper at Sialkot also deserve mention.

Population. The total population of the province is 34,309,861 out of which a major portion i.e., 29,269,090 live in villages whose number is 52,047 and only 5,040,711 live in urban centres whose number is only 283. The 1941 figures show an increase of 5 million over 1931 figures, a fact of that points towards settled conditions and progressive development of agriculture in the province. In the canal colonies, the increase in population during the last fifty years has been tremendous*. The reasons are quite obvious. A study of density figures for the various regions of the Punjab shows that it ranges from the very lowest (54 in Chamba) to the very highest 899 in Amritsar). The density is mainly determined by conditions favourable to growth of agricultural crops. Presence of industries and markets as in Amritsar, Lahore and Ludhiana also tend to affect the figures.

The Punjab is a Muslim majority Province with 16,217,742 Muslims. Figures for others are below :

Hindus (excluding scheduled caste).....6,301,737.

Scheduled caste1,592,320.

Sikhs5,116,185.

Canal Colonies. Settlement in the canal colonies is quite a recent affair and as already mentioned the population in these districts has gone up tremendously only during the last half a century. All this has been possible only by the development of irrigation specially canal facilities in the formerly barren lands, rainfall here being very low.

	* Montgomery	— Lyallpur —	— Multan —	— Jhang —	— Shahpur
1881	384,312	53,832	555,516	390,630	383,662.
1941	1,329,105	1,329,105	1,484,333	821,631	998,921.

The colonists fall into three categories (i) the small peasant proprietor, who is given about a square of land (except in Shahpur and Montgomery where an additional square is given to maintain mares and camels for breeding) (ii) the middle class farmer (Yeoman farmer) was given from 4 to 5 squares of land; (iii) the land lord who got from 6—20 squares.

Process of Settlement. Before the construction of a canal the tract to be colonised was divided up into large squares and rectangles. The shape and size of the sub-divisions varied from place to place. A square or rectangle was the usual unit of allotment and each such unit was further divided into acre, squares or rectangles known as Killa. In the Triple canal colony nearly 4 million such small rectangles and squares have been demarcated. The next step was soil survey to eliminate the worthless soil from the point of view of irrigation.

By this system every colonist got his land in one compact block, and the other advantage is that the holding can be further divided equally and cheaply after the death of the father.

After the completion of the squares the next step was to mark the boundaries of estates which were to be formed. The idea was to make boundaries of each group of allotments to coincide with the boundaries of the area commanded by the watercourse which irrigates it. As a rule two or three chaks were to constitute a village. The size of these chaks varies widely but there has been a tendency to decrease the size of the villages to 1,800 acres or even less. No two villages ordinary get irrigation from the same source. After the settling of the village was determined, the main streets were demarcated and some land was set aside in the vicinity for grazing and for the accommodation of the manuring heaps. Proper attention was paid to sanitary arrangements also.

Houses.—In the earlier stages there was no fixed plan and anything which could be called a house was allowed to be built. It was first in the Nili Bar colony and other more recent colonies that regulations were made out for the general layout and sanitation of the houses. The chief points are :—

- (1) A minimum height of 12 feet for living rooms.
- (2) No back to back houses.
- (3) Provision of good windows, a separate kitchen and separate godowns and cattle sheds.
- (4) A verandah and a good court yard.

The houses are generally of mud and sunbaked bricks. The roof consists of wood covered with impervious mud. Occasionally the roofs are thatched. The clay has to be renewed every year before the rainy season sets in. The houses are mostly one storeyed.

The ordinary position of the village well is the central chowk. When ever there is an old well near the village no new well is constructed. Tanks for washing are also provided at easy distances. Near about the younger colonies small recreation grounds have been provided which are used for ventilation and exercise. Near about the ground we have school play ground, and brick kilns. Tree planting is encouraged in the colony schemes to provide for timber and fuel and thus to spare the cow-dung for manuring purpose. The trees increase the humidity in atmosphere thus tempering the hot dry climate of the South-west Punjab. The roads are lined by trees.

Colony Towns. The location and layout of colony towns have been done in close co-operation with the Railway, Public Health, Irrigation and Public Works Departments. The towns have been selected at intervals of at last 20 miles thus giving each town a radius of 10 to 14 miles. The pure water supply for drainage, suitability of soil in the neighbourhood for brick making have been kept in view.

The rectangular block system has been adopted (Montgomery, etc.) All main thorough fares are straight and all open spaces in the town lie on one side on the main road. Road junctions with wells in the middle are avoided. Village roads from the villages to the railway stations do not pass through the main bazaars.

Every town and its area (12 miles radius) is self contained having mundis, factories, schools, and hospitals. Factories, are always outside the towns and mundis are always near the railway station. Local markets, vegetable, fruit and meat markets, are on main roads. Every town has a veterinary hospital with its slaughter houses nearby. Bathing tanks for men and women are situated in the public gardens on the out-skirts. A sarai is always provided near the railway station. Plots have been reserved for the religious buildings of various communities. Every town has an open space reserved for annual fairs. Like the village back to back houses are not allowed.

With the increase in population and development in commerce and industry most of the towns are losing their original plan and are growing in different sites in a haphazard manner.

The municipalities are slack in fulfilling their obligations and usually no attention is paid to ventilation and sanitation in badly managed towns.

Wheat and cotton are the two chief crops of the colonized area and their dominance has a marked influence in the lay-out and construction of towns. Towns like Lyallpur lying in wheat zones abound in grain elevators and flour mills. Cotton cultivation is responsible for the appearance of ginning factories and cotton presses.

PUNJAB

The province of the Punjab to-day presents a picture of all-round development and economic prosperity. Besides being the largest producer of wheat in India it is also one of the largest producers in the world. The Salt Range contains the largest known deposits of salt in the world. It is also quite advanced in the matter of industries. The number of factories is about 800 employing about 70,000 workers. The total mileage of roads is about 26,000 miles including 5,600 miles of motorable metalled roads. There are about 7,000 miles of railways in the province. The mileage of navigable canals is good. Important towns are either (1) grain markets like Lyallpur (wheat), Multan (cotton), (2) industrial centres like Ludhiana, Amritsar and Ambala, (3) or railway or road centres like Lahore which is also the capital.

Note :—We have purposely not followed the usual scheme of natural regions given by different books as most of them have confused natural regions with Physical regions. Dudley Stamp gives 3 natural regions viz (1) The North-Western Dry Hill Region ; (2) The Himalayan and Sub-Himalayan Region and (3) The Punjab Plains (a) N. E. Plain (b) South Central Plain (c) S. E. Plain. The census department has (1931) divided the province into 4 natural divisions based on physical and climatic features viz (1) Indo-Gangetic Plain West ; (2) Himalayan (3) Sub-Himalayan and (4) North-West Dry area.

We believe that the agricultural zones described serve our purpose best.

SINDH

The province of Sindh occupies the entire natural region entitled the Lower Indus Valley. Like Orissa, Sindh was also created a new province in 1936, it formerly being a part of the Bombay Presidency. The province has an area of 48,136 sq. miles and a population of 4,535,008, out of which about 59 percent are engaged in agriculture and other industries and about 10 percent in industries most of which are cottage industries, the province being poor both in power resources and minerals. Physically it is a part of the great Indo-Gangetic Plains and is characterised by an Alluvial plain stretching from the edge of the Baluchistan Plateau on the west to the Thar desert on the east. The Indus which is the true life-giver in the absence of rainfall flows through the province. It is also the hottest region in India as "The Thermal Equator passes through Sindh and the Tropic of Cancer almost touches it."

A great deal of Sindh is essentially a flat desert having extremes of climate. Situated on the verge of both the monsoons, it gets rainfall only to the extent of much below 10". The soil, however, is such as can easily benefit from irrigation and is capable of producing good crops. It is, however, not so rich as the soil of the Ganges Delta. The water supplies in the Indus are varying being quite low during the eight months of the year and.

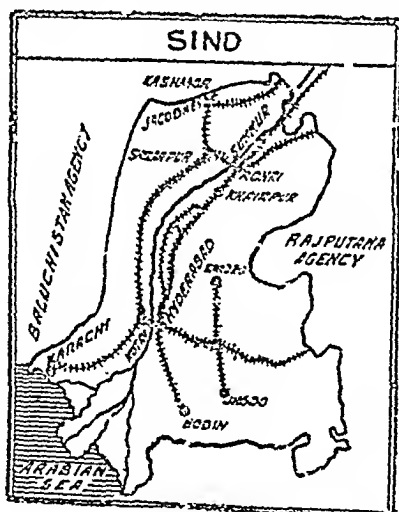


Fig. 74.

during this period only the old Faleli canals and the works at Sukkur and Jamrao can supply water to the adjoining lands. The Lloyed (Sukkur) Barrage was opened in 1932, about 80 per cent of the cultivated area is irrigated by the canals of this system. The barrage now provides perennial irrigation to more than two million acres and has brought about an extra three million acres under cultivation. The system boasts of 5,000 miles of main canal works and 700 miles of branches. The Rohri canal is 208 miles long and commands an area of 2,837,000 acres by means of 1,887 miles of distributaries and 20,246 miles of water courses. Seven canals, 3 on the right and 4 on the left have been dug. M. B. Pithawala gives a good account of the advantages of the Barrage which he calls "The EL Dorado of Sindh."

"Due to the flowing of the Barrage canals, enough water has been assured, irrigation has become perennial and the crops have surpassed the estimates for 1931-62 even within these 5 or 6 years. The cotton crops, for example, have increased from 3 lakhs acres in 1932 to 8 lakhs in 1935 and 9 lakhs in 1938. In the Khairpur State alone the Rabi cultivation has increased from the average pre-barrage yield of 63,846 acres to 1,33,927 acres in 1936-37, i.e., more than 109 percent. Can anything better be expected? Side by side with this, effective research work as regards reclamation of Kalor lands, soil fertility, crop improvements, etc., is going on at Sakrand, Daxri, Mirpurkhas and other centres in the valley. Horticulture is another new line of development in Sind. Thus all round the agricultural wealth of Sind has increased on account of the Barrage."

The total area commanded by the Barrage in the British territory excluding the Khairpur State, which too is so greatly benefited by the two powerful feeders, is 7,406,000 acres; of this 5,042,000 acres are expected to be cultivated, as they are cultivable. As the area cultivated before the Barrage was only 2,037,000 acres, the increase in the very first year alone was 407,178 acres. The annual total crop of grain and cotton is approximately 2,000,000 tons. The results, on the whole, are very promising indeed. Even the population is getting re-mobilised in the Barrage Zone, on the same account.

That the Barrage is really a great boon to the people of the province can be proved very easily. A single instance will suffice. Usually a moderately deep well for irrigation purposes in a field of 5 acres costs Rs. 600, that is, one for one acre costs Rs. 120, over and above the lifting charges, while the water supplied perennially both for the Rabi and the Kharif seasons under the Barrage System costs Rs. 33 only per acre of holding. What a great saving of money and of anxiety besides! Those of the Zamindars or Khatedars, small or big, who are hard-working and who care to cultivate *their own fields*, are bound to make good profits by agriculture alone in future years.

Crops :—Land utilisation figures for Sindh in 1937-38 were :—

Area	30,179.5	thousand of acres.
Cultivable	10,013.7	"
Waste	19,448.1	"
Forests	717.7	"

One point to note is that the Indus delta, unlike the deltas of the Ganges, is useless and wild having some pastures.

The following table gives the percentage share of Individual crops :—

Millets	...	34
Rice	...	25
Wheat	...	12
Cotton	...	7
Oil Seeds	...	6
Other foods	...	9

It is natural to be assumed that crops specially those requiring large quantities of water get unimportant as we move away from the river and the canals.

Minerals. In the matter of actual mineral production Sindh is very poor. As a matter of fact no systematic geological survey has been made of the area and as such no definite information regarding the hidden wealth is available. The tertiary deposits of Kohistan are supposed to be rich in brown coal, iron, alum, gypsum and clays of various types. Salts abound in the salt beds and lakes. Prospecting in recent years claims that Sindh is a big potential oil field, specially at Drigh road. But nothing definite is known as yet. Abundant deposits of common salt have been discovered in the Indus Delta and it is reported that they could easily last for 40,000 years is at an allowance about 10 seers per head for year. Salt works are situate at Mauripur. Industrially the province is very backward. It is just to show the great unimportance of industries that we give the following table showing the average daily employment in large industrial establishment in the province the number of which is the lowest possible :—

Textile	...	...	449
Minerals and Metals	...	...	66
Paper and Printing	...	...	516
Gins and presses	...	...	75

Fishing. Fishing as yet has attained no importance in the economy of the province although it is hinted that this industry could be very profitable. The Sindh coast contains good quantity as well as quality of fish. The Indus too could be profitably used for the same purpose. Pearl-fishing also holds out bright prospects. The native oyster is well known all over.

*15,419 persons are employed as seasonal labour.

Population. Sindh as a population of 4,535,008 out of which most of the people live in villages of which there are about 6,533 in the province. The number of towns is only 26, and except for Karachi, Sukkur and Hyderabad not many of them should really be called towns. Out of every 100 workers 60 are engaged in agriculture and animal husbandry and only 10 per cent in manufacturing industries most of which are of the cottage type. Most of the people live in places near the rivers or canals. A number of new settlements have come to be in the newly created colonies in the Barrage region only 15 per cent of which was unoccupied or uncultivable. Sindh, therefore, presented peculiar colonization difficulties. Most of the land commanded by the Barrage was privately owned and individually cultivated. Owner lands were only few and these were auctioned before the construction of the Barrage and the money thus realized was used in its construction. There, therefore, exists no uniformity in the layout of the settlements or in the size of holdings. The crown lands were sold out after rectangulation. Land was first leased out only for 5 years after which period only the earnest ones were allowed to retain on some fixed payment.

Sindh is a Muslim majority province having 3,208,325 Muslim other communities claim :—

Hindus	...	...	1,038,292
Scheduled caste	...	...	191,634
Sikhs	...	...	31,011
Christians	...	...	20,209
Parsis	...	...	3,838
Jews	...	...	1,082
Jains	...	...	3,687

Sindhi is the language of the province. This language bears affinity to Sanskrit, but it has worked influence of Persian and Arabic language and is also written in Persian Arabic script.

Sindh is very poor in the matter of inland transport specially railways and metalled roads. There is a small total of 11,702 miles of roads out of which only 263 miles are metalled. In the matter of railways it is equally poor. "A shorter cut to Bombay of rail is another boon long looked for so that such other hinterlands as ports of Gujrat, Rajputana Kathiawar may also be opened out for Karachi." A mention has already been made of the importance of Karachi as a port and an air-base. It is also the capital of the province and the largest railway centre. Hyderabad and Sukkur are important inland towns situated on important railways.

UNITED PROVINCES

Extending eastwards from the Jumna and lying more or less in the centre of Northern India is the United Provinces. It has a total area of about 106,247 square miles excluding the Native States of Benares, Rampur and Tehri-Garwal (total 6,276 square miles). The total population amounts to 49,614,833.

Physically more than seventy-five per cent, of the province forms a part of the greater Indo-Gangetic plains.* In the north it also includes portions of the Himalayas and the sub-Himalyan tract. The southern portion lying south of the Jumna (later on the Ganges) is geologically lined with the hills and plateaus of central India—Bundelkhand. This rough area in the south represents the northward limits of the Vindhayan rocks. It is broken up by low, rocky spurs of the Vindhayan hills covered with stunted vegetation. Isolated patches of black cotton soil occur here and there.

The drainage of the province finally falls into the Ganges. The rivers play a very important part in the economy of the province.

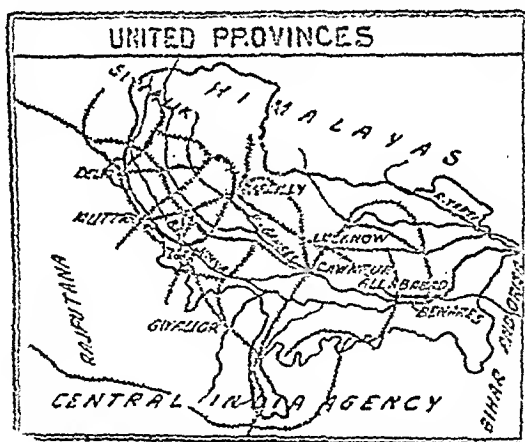


Fig. 75.

Climate. The province lies entirely within the temperate zone but falls like the rest of North India within the tropical monsoon type of climate on account of the Himalayas that lie in the north of the region. The Himalayas completely divide the climatic conditions in Tibet that lies to their north and India that lies to their south. This change is both in temperature and rainfall, in making India

*This province like Punjab has been dealt with in detail

†Before 1937 it was called "the United Province in Agra and Oudh.

‡Nowhere higher than 600, except in the west near Saharanpur.

comparatively warmer and wetter than Tibet. The seasonal variations in climate are of importance because the activities of the agriculturist depend on them. The year can readily be divided into three distinct seasons, viz., Cold Season from October to March, Hot Season from March to June, and Rainy Season from June to October.

Cold Season. This comes after the rains, about the middle of September, and goes on to the end of March. The south-west monsoon that had given rainfall in the preceding months, dies down. In some years, especially when the south-east monsoon comes late in June, there are a few showers in October and this fact is rather beneficial to the *Rabi* (winter) crops, e. g., wheat, barley, etc. The temperatures decrease considerably and continue decreasing till January. The weather remains bright and clear, the days are not so cold except when there is a breeze, but nights get very cold, and sometimes in January the temperature falls considerably in the night. January is the coldest month of year, and the mean temperature comes down to 53°F. to 69°F. With the advent of February, temperature rises again and means come up to 58°F. to 69°F. The difference between the daily maximum and minimum is generally great. The winds that prevail during these months are generally north-west or west, and as they come from dry lands they have practically no moisture. These winter winds are generally very slow and their speed always averages between two and three miles an hour. Whatever small rainfall is received during this season is given by shallow land-storms that are believed to be moving eastwards from the Iran plateau and other local dust-storms. These dust-storms continue eastwards and sometimes go as far as Bengal. Temperature rises with their advance, sometimes by 20 to 30 degrees. Their origin and cause is still an undecided fact. Kendrew thinks that they resemble the cyclones of the westerlies and that they are the eastward continuation of the Southern European disturbances. If they originate in Iran Plateau, from whence do they get the moisture, and why by the time they reach India are they not deprived of it by the series of mountains and of tablelands that they have to cross on their way to India? While on the other hand in summer the south-west monsoon that originates in the Bay of Bengal loses all its moisture by the time it reaches the North-west Frontier Province, and is practically without any moisture when it crosses (it at all) the Karakoram and Carpathians Mountains situated on the western frontier of India. Their origin is still to be enquired into by the meteorologists.

Hot Weather. By March the temperatures begin to rise rapidly and the mean comes up to 80°F. In April and May the temperature continues to rise when it reaches its maximum about 90°F. The maximums vary according to stations and

somewhere they rise as high as over 115°F . June is equally hot except for the later part of it when some rainfalls and temperature falls by two or three degrees fahrenheit. The winds are generally strong and westerly and sometimes accompanied by severe sand-storms that uproot trees and do considerable damage to buildings and cultivation alike. Precipitation hardly exceeds one inch and the storms mentioned above may be held responsible for it. This is the reason why the farmer prepares his fields for his summer crops and waits for the rain to sow his crops, but sometimes with the help of irrigation he sows crops earlier.

Rainy Season. There is a sudden change about the middle of June. The south-west monsoon sets in and the atmosphere gets cooler, but when the rains fall there is no wind and the atmosphere gets stuffy. Temperatures tends to lower down at all places. The Bay of Bengal branch of the south-west monsoon first goes through Bengal to Garo and Khasi Hills in Assam. It is then deflected eastwards and begins its journey into Bihar, U. P. and the Punjab. The presence of these hills in Assam is the most important factor in the matter of the rainfall of these provinces.

In our area the monsoon usually breaks towards the end of June. The probable date when it reaches Allahabad, may be said to be the 20th of June. There is not much difference between the time of its arrival at Allahabad and when it arrives at Agra or Meerut. The intervening period may be a week or less. We have to rely on conjectures on this point. The approximate dates when it arrives at different places in our region in a normal year have already been illustrated. The rain normally continues till the first week of October. During these months the greatest percentage of the total rainfall is received.

Rainfall decreases from the east to west. Allahabad gets 37.22 inches of rainfall every year while it gets less and less as we proceed towards Fatehpur (15.18 inches) Cawnpore (31.85 inches) and Agra (25.08 inches). It also decreases as we get away from the northern hills; Bareilly and Pilibhit get 44.48 inches and 49.05 inches respectively. Then there is a sudden decrease as we get away from the mountains, Shahjahanpur 37.38 inches and Budan 32.91 inches.

As a whole the rainfall conditions are very erratic. The rainfall is very unevenly distributed. Seasonal or general rainfall deficiencies are not unusual and have been responsible for many famines in the past.

From the agricultural point of view rainfall distribution throughout the year is more important than the total rainfall. The ideal rainfall distribution is a good fall in June when the farmer sows his summer crops, then a short break, moderate rain

in July, August and September and about two or three inches in the first week of October. This distribution enables the farmer to plough the rain-softened fields at the end of June and sow his summer crops, which generally comprise rice, maize, sugar, cane-cotton and certain pulses. These summer crops need no irrigation if there is distributed rainfall in July, August and September. An early cessation of rains or long breaks in the monsoon or overflowing of the fields by rainfall mean damage to the crops. The first two are more usual in our area and that damage to crops can now be mitigated by irrigation.

A good shower in October ensures a good sowing of the winter (rabi) crops which consist of wheat, barley, gram and pulses. These are sown in October and reaped in April. Timely rains at the end of December or early January are good for these crops. These crops generally need irrigation. Irrigation also helps the farmer to sow his sugarcane in March so that the fields may be ready for harvest in October when winter crops are grown. From the foregoing remarks it will be seen that without irrigation agriculture in the western districts is a gamble in rain.

The Ganges Jumna Doab has good irrigational facilities including wells, tube-wells and canals. Tanks are also in use in the southern districts. A detailed account of the irrigational works has already been given in the chapter on irrigation. Here only passing references are needed. About 15% of the total area cultivated is irrigated in the whole province, but the percentage in the west and in the districts of Shahjahanpur, Hardoi and Pilibhit is quite high as most of the works are situated in this area. In the matter of well irrigation U P. stands highest with 11,33,412 wells irrigating about 53,03, "Ganges valley tube well scheme" is the most important scheme in India irrigating about 800,000 acres. The province also has good canal system. It boasts of 2,371 miles of main channels and 11,756 miles of distributaries irrigating about 3.9 million acres. There are three large canal systems and three smaller ones. In the lower category the Upper Ganges Canals and the Lower Ganges Canals are quite old, while the Sardar Canal is of quite a recent origin. The Bundelkhand canals, and the Agra and the East Jumna canals are smaller works.

Crops. Agriculture is the chief industry employing about 70 per cent of the people. The soils of the plains are very fertile. The rainfall is between 30" to 40" in the west and above 40" in the east. Bundelkhand is not so fertile and the rainfall too is quite low. The land utilization figures are :—

Total area	...	67,849,000	acres.
Cultivable	...	38,809,000	"
Waste	...	19,877,000	"
Forest	...	9,275,00	"

To this may be added figures for unproductive works.

Rice and sugarcane are very important in the eastern most districts while wheat, cotton and sugarcane are cultivated in western cultivated areas. Millets thrive well in the southern parts. The slopes of the mountains and the valleys also yield some hardy crops and tea. The following table give figures for individual crops:—

Rice	...	7.56	Million Acres.
Wheat	...	7.5	" "
Sugar cane	...	1.2	" "
Barley	...	3.7	" "
Millets	...	2.31	" "
Cotton	...	.6	" "

Minerals and Industries. U. P. is not important for mineral production. The chief minerals are coal in southern Mirzapur district and iron and copper ones in the Himalayan districts. Firestone, Gypsum and sandwihch are useful for glass manufactures are also available small quantities of gold are bad by washing the sands of some of the rivers in the hills. Power is had from the Ganges Grid scheme. Only about 11 percent of the people are engaged in industries. In 1939-40 there were 546 factories employing a maximum of 159,738 workers. Sugar, textile, leather and glass are the chief industries of the province. There are 83 sugar mills, 3 woollen mills and 25 cotton mills. There are also some leather factories in Cawnpore and elsewhere. Saharanpur and Allahabad manufacture cigarettes. Lucknow has an important paper mill. Cawnpore is the chief industrial centre of the province and has the maximum number of textile (specially cotton) leather, oil and soap factories. It is also a very important railway junction and perhaps the largest trade centre.

U. P. is well served by roads, railways and river transport. It has some 30,770 miles of roads, 8,10 miles of which are metaled. The province also possesses the longest railway mileage in the country. There are 33 miles of railway to every 100 sq. miles of area nearly all the rivers are used for boat traffic. The Upper and the Lower Ganges canals are also navigable throughout.

Population. The total population of the provinces is 496,14,333. The density is highest in the plain districts specially in places of higher rainfall or good irrigational facilities as they leave a direct bearing on agriculture which naturally controls population. The great pressure on the soil is clearly evident from the following table.

<i>District.</i>	<i>Density</i>
Benares	... 930
Lucknow	... 814 Average for U.P. 442.
Jannpur	... 797 " " Doab 457.
Meerut	... 699
Muzaffarnagar	... 541
Bijnor	... 466
Kheri	... 318

The increase in population has been marked in those places which have seen an increase in irrigated area. For example Benares and Jaunpure two new canal districts yielding 8.1 rec. and 2.2 p.c. increase in 1881-1931. While Meerut and Bulandseher and Muzaffarnagar, which have seen great irrigational development have registered an increase of 24 per cent and 23 per cent and 19 per cent respectively.

The most striking factor in the distribution of population as that out of every 1,000 persons only 112 are urban and 288 are rural. This is quite in accordance with the general trend in the country where agriculture is the main occupation of the people.

The province is predominantly Hindu, about 83.27 per cent are Hindus and 15.2 per cent Muslims. Hindustani is the common language of the province. Urdu and Hindi are two literary languages. Lucknow and Allahabad share the provincial headquarters while Nainital is the summer capital. Other important towns include Cawnpore, Meerut, Benares, Hathras, Aligarh and Mirzapur. A mention regarding the importance of the towns has already been made.

Natural Regions. It is now possible to divide the province into natural regions Dudley Stamp has given four main divisions. (1) The Himalayas Regions. (2) The Sub-Himalayan Region. (3) The upper ganges valley, (4) The middle ganges valley. Regent researches have, however, modified these regions B. N. Mukerji divides the province agriculturally and takes into consideration relief, climate, irrigation crops and population. His divisions are :—

1. The Himalayan Region.
2. The Sub-Himalayan Region or the Siwaliks.
 - (a) The Siwalik proper including the boons.
 - (b) The Bhatar zone.
 - (c) The Terai.
3. The Gangetic Plain.
 - (a) Transition zone.
 - (b) Wheat zone.
 - (c) Rice zone.
4. The trans-Jumna Tract.
 - (a) Black soil belt.
 - (b) Red soil belt.
 - (c) The Gurdwara Belt.

In a note Dr. Mukerji explains the basis of his division thus :—

The Himalaya and Siwalik's divisions are based on certain heights; Gangetic plain misolvet for the distribution of principal crops and the trans-Jumna tract on the rock and soil types.

Each sub-division of the Gangestic plain, viz. wheat transation and rice zones has been further sub-divided into smaller units based on the basis of irrigational types.

Mukerji's divislon is veterinary an improvement on the elementary division of Dudley Stamp. Below we give a summary of Mukerji's divisions.

The *Himalayan Region* comprises of the outer and the inner Himalayas down to an altitude of 5,000 feet contour lines. Some agriculture is carried on the lower slope which have been cleared for the purpose. The valley have attracted certain amount of settlement. The forest resources are vast but most of the forests await exploitation. Some Tea is also grown for export specially near about Dehra Dun. Not many people live here and the density decreases as height increases. The hill stations attract seasonal populations.

The *Sub-Himalayan region* includes the foothills of the Himalayas upto 5,000 feet. A narrower strip of plains lying just below the mountains is also included. This region is unhealthy and forested owing to heavy rainfall. The lower slopes of the Siwaliks are prosperous agricultural areas as the forests have been cleared. Wheat and tea are the chief crops. Irrigation water is available. The Bhalier presents a recent formations of boulders and gravel into which the streams get lost to reappear in Tarai situated southwards. The climate is damp and unhealthy. Population is mostly migratory. The Tarai is a land of marshes and fens. Southwards the Terai merges into the Gangetic Plain. Rainfall is heavy and vegetation consists of thick forests and tall grasses. Climate is unhealthy and malarious. More and more is now being reclaimed specially in the west where the true Terai has more or less disappeared. Rice, wheat, maize, and sugarcane are the chief crops. A few railway lines serve the area. Population is quite dense specially in the east.

The *Gangetic plain* measures about 500 miles in length and about 150 miles from north-west to south-east. The region is the translation area between the West Bengal and Bihar and arid Punjab. The doab is more akin to the Punjab, while Oudh resembles Bengal and Bihar more. Wheat cotton, and sugarcane and cotton predominate in the west and rice and sugarcane in the east. The doab also bosts of important canals and tube-well schemes. Most of the irrigation in the east is done by means of masonry wells. In between the wheat and the rice, zones may be observed a narrower area having characteristics of both, it being neither very dry nor very wet-transition zone.

The *Trans-Jumna Tract* includes the whole of Bundelkhand portions of Allahabad and Mirzapur districts lying south of the Ganges. Geographically and Geologically this area is quite different from the Gangetic plains and is more akin to the Central Indian uplands and plateaus. But the area slopes towards the Ganges in the north and as such it is included in the gangetic Basin. Bundhelkhand or the black soil region is the best part of the land, leaving a fairly good system of canal irrigation. Agriculture is followed. Dry zone crops are raised.

Red soil predominates in the southern portions of Jhansi, and Hamirpur districts and in portions of Mirzapur district. The soil being poor, agriculture is precarious. Only one crop can be raised in one year. Population is sparse. Most people live near rivers and agricultural lands.

The *Vindhayan Belt* includes the lower portions of Banda and Allahabad districts and the upper portion of Mirzapur. The region is a part of the Vindhayan plateau and the soil is poor and thin. Agriculture is very precarious. Some portions are forested.

Gondevana Rocks are found in the lower portions of Mirzapur district. Soils are poor and a big part of the area is bad. Grazing is the most important occupation. Some forests still exist. Many tribal settlements occur in the region. They follow some cottage industries. Communications are in a bad state.

Chief Commissioner's Provinces.*

1. *Ajmer Marwara* is an isolated British territory in Rajputana. Its total area is 2,400 square miles and its population is 5,84,000. It is covered with hills and is unsuitable for cultivation. Rainfall is low. Hardy crops are grown. Cotton is also grown with the help of irrigation.

2. *Delhi* along with its surrounding area was made separate province in 1912, when it was made the capital of India. It covers an area of 573 square miles and has a population of 636,245. out of which about 450,000 live in Delhi proper including New Delhi. Delhi is the most important railway junction in India where most of the important railways of India meet. It is also an important trade centre and has a number of mills of all descriptions, specially cotton, flour and sugar. It is surrounded by fertile lands.

3. *Coorg* is a small province to the South-West of Mysore. It has an area of 1,893 square miles and a population of 169,000. Its capital is Mercara. Agriculture is carried on, coffee being the most important product.

*Baluchistan has already been described.

The Indian states are divided into many categories according to their size and importance. The British Government has fixed the number Salutes for various states. Various categories are A-21, B-19, C-17 D-15, E-13, F-11, G-9. Below we give names of states according to this classification.



Fig. 76.

Category A

Baroda ; Gwalior ; Hyderabad and Berar ; Jammu and Kashmir ; Mysore.

Category B

Bhopal ; Indore ; Kalat ; Kolhapur ; Travancore Udaipur (Mewar).

Category C

Bahawalpur ; Bharatpur ; Bikaner ; Bundi ; Cochin ; Cutch ; Jaipur ; Jodhpur ; Kaurali ; Kotab ; Patiala ; Rewa ; Tonk.

Category D

Alwar ; Banswara ; Bhutan ; Datia ; Dewas (Senior Branch) ; Dewas (Junior Branch) ; Char ; Dholpur ; Dungarpur ; Idar ; Jaisalmer ; Khairpur Kishangarh ; Orchha ; Partabgarh ; Rampur ; Sikkim ; Sirohi.

Category E.

Benares ; Bhavnagar ; Cooch, Behar ; Dharngadhra ; Jaora ; Jhalawar ; Jind ; Junagadh ; Kapurthala ; Nabha ; Nawanagar ; Palanpur ; Porbandar ; Rajpipla ; Ratlam ; Tripura.

Category F.

Ajaigarh ; Alirajpur ; Baoni ; Baiwani ; Bilaspur ; Cambay ; Chamba ; Charkhari ; Chhatrapur ; Chitral ; Farnkot ; Gondia ; Janjira ; Jhabna ; Maler Kotia ; Mandi ; Manipur ; Morvi ; Narsingarh ; Padma ; Pudukkottal ; Radhanpur ; Raigarh ; Sailana ; Samthar ; Simur ; Sitamau ; Suket ; Tehri (Garhwal) ; Wankaner.

Category G.

Balasinos ; Banganapalle ; Bansda ; Barundha ; Bariya ; Bhor ; Chhota Udepur ; Danta ; Dharampur ; Dhori ; Haipaw ; Jawhar ; Kalabandi ; Kengtung ; Khilchipur ; Limbdi ; Loharu ; Limawada ; Maihaa ; Eayufbhanj ; Mong Nai ; Modhol ; Nagod ; Palitana ; Patna ; Rajkot ; Sachin ; Sangli ; Sant ; Savantvadi ; Shahpura ; Sonpur ; Wadhwan ; Yawnghwe.

1. *Kashmir (and Jammu)* is in the north of the Punjab beyond the Salt Range. It has an area of 84,471 and a population of 3,945,000. It is an entirely mountainous region. Physically the state could be divided into some three parts (a) Upper Kashmir drained by the Indus and its tributaries ; (b) Middle Kashmir drained by the Jhelum and Kishenganges rivers ; and (c) Lower Kashmir comprising of a strip of low, level land along its southern borders. The Valley of Kashmir is a tectonic valley and is intermount from all sides, situated at a height of 5,000 feet. The origin of this valley like the valleys of Katmandi is attributed to the silting up of some

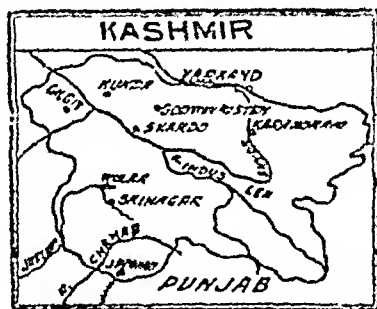


Fig. 77.

big lakes. The Wuller lake and the Dals near Srinagar are reported to be remnants of those bigger water bodies. The Jhelum that flows through this valley is navigable here. As a whole the region

is dry and the temperatures are usually low. At Sri Nagar the January temperature is 31 degrees F in July it is 73 degrees F. The rainfall is heaviest during January-April and it is about 14 inches. Most of the winter precipitation is in the form of snow. There are extensive forests rich in timber. Chief crops of the state include rice, maize, wheat, oilseeds, saffron, fruits, barley and tobacco. Mineral resources, though meagre, include coal, bauxite, fuller, earth zinc, copper, precious stone, and gold and lead. Not much is known, however, about the mineral wealth of the state. The silk filature in Srinagar is the largest in the world. The people follow a number of cottage industries, the products of which are famous all over. The railway mileage is very small in the state. Motorable roads are also not many, although the Jhelum Valley Road (106 miles) is supposed to be one of the finest motorable roads in the world. Srinagar is the chief town and the Capital. Gulmurg, Jammu and Pahalgam are other cities. The Jammu Hydro-electric Installation on the Ranbir canal of the Chenab river is deserving attention. The Jhelum Power Installation and the Muzaffargarh Hydro station also deserve attention.

2. *Mysore** with an area of 29,326 square miles and a population of 7,328,896 represents a rocky triangle situated in the south of the South Indian Tablelands at a place where the eastern and western ghats converge towards the Nilgiri hills. The average altitude of Mysore is 2,000 feet, representing perhaps the highest area in the plateau named the Deccan. "Mysore may be cited as an example of the plateau of erosion. The prolonged denudation, that the state has been subjected to, has left only the remnants of the former schists which in all probability were once much more extensive than they are now. The affect of mealbering has been to emphasise the original irregularities in surface features and many of the chains of hills are composed of hard work, while the comparatively softer rocks have been worn away. Many rivers have carved out broad valleys. Cauvery is the most important river : others include its tributaries and also the tributaries of the Kistna and Penner.

The region lies entirely in the rain—shadow of the Western ghats and naturally rainfall here is quite low, nowhere more than 40 inches this figure however represents the highest, there are places that receive even less than 30" or even 20". The heaviest rainfall takes place in a strip along the west, irrigation therefore, is a necessity as the rainfall besides being lower is also irregular. Tanks are generally used for storing water canals and wells are not possible to build owing to the rough topography. Temperature extreme on the whole a bit higher than in the plains but climate tends to be exempted.

*For a fuller account of the geology of the Mysore plateau refer to the topography of Mysore by C. S. Bishamattu. The Calcutta Geographical Review, January, 1944.

Agriculture is the main occupation employing about 75 per cent of the people. Millets, rice, grain and sugarcane are the chief crops. Cotton and groundnuts are also cultivated. Sericulture is followed as a subsidiary industry by the farmers. Area under mulberry in 1944 was 75 thousand acres and this shows a tremendous increase over the previous figures. The industry has bright prospects. Cattle breeding and dairy farming are also very developed, veterinary arrangements being very good.

The state is not very rich in minerals. Gold is mined at Kolar, the annual output being about half a million ounces. Manganese ore and chromite are also mined. Coal and petroleum are both unknown in the state and as such charcoal is greatly used for industrial purposes. Bharmati iron and steel works make use of charcoal from the neighbouring forests. Hydro-Electric power is quite developed as already stated. Silk and iron and steel are the two major industries of the state. Lac industry is also quite important.

The population is not very dense, average density being about 150 persons per square mile. More people live in the fertile valleys in irrigated tracts. The population consists mostly of Hindus speaking Kanarese. Mysore, the capital and Bangalore, the famous hill station are the two most important towns of the state. The Mysore Railway has a total mileage of over 700 miles.

3. *Hyderabad* is situated just to the north of Mysore. With an area of 100,365 square miles and a population of 19,194,313, it is the largest Indian state in the country. Berar is also a part of Hyderabad but it is administered by the C. P. Government. The whole state lies in rough lands, the Eastern half being a part of the black cotton-soil-region, Godawari in the north and Krishna in the south drain the region. Large quantities of cotton and millets are grown in the western region while the eastern is not so fertile. Generally speaking the temperature is higher than in Mysore but there are places which experience quite low temperatures specially in winter. The climate is inclined towards the extreme type. Rainfall is on the whole quite uncertain. North eastern part gets between 30 inches to 40 inches.

Agriculture is the chief occupation of the people. Rice and millets are the chief food crops. Rice is grown only in places of higher rainfall or where good facilities for irrigation exist. Tank irrigation is important in the state. The Osman Sagar and the Nizam Sagar is the biggest in India. Cotton is the chief fibre and crop and occupies an area of about 3 million acres specially in the black cotton-soil region. Oilseeds are also quite important.

Hyderabad has some coal mines, the most southerly of the Indian coal mines. The chief fields are situated in Sastri, Sungarani

and Paoni. The total production is 12,81,566 tons. Limestone and mica are other important minerals. Marble is found at Warrangal. Cotton manufacturing is the chief industry of the state; local cotton is used. There are also some cigarette factories and a number of button manufacturing institutions. Cement is manufactured at Shahbad from the limestone mines nearby. A paper mill has also been established at Kothapetta. The Nizam's State Railway has a mileage of 1,359 miles (mostly narrow gauge). In the matter of roads too, Hyderabad is not behind. It has about 4,000 miles of motorable roads. The state has its own motor service in Hyderabad proper and in some other districts. Hyderabad, the capital is also the most important railway centre. It also boasts of a number of industries specially cotton, soap and cigarettes. Secundrabad is the suburb of Hyderabad. Aurangabad and Warangal are also important towns serving their respective regions. They are also important railway centres.

4. *Rajputana* is the name given to a big area measuring about 135,091 square miles and occupying the dry, desert lands surrounded by U. P. in the east, Punjab in the north and Sindh in the west. The Thar desert has its largest share in Rajputana. Politically it consists of a number of Indian States and the British territory of Ajmer-Merwar (already described.) The region consists of the northern lowland and a southern region of rough topography the Rajput Uplands (constituting Satpura hills, the valleys of Eastern Rajputana, the Mlwa plateau and the northern slopes of the Vindhaya Hills and portions of the Narbada Valley).

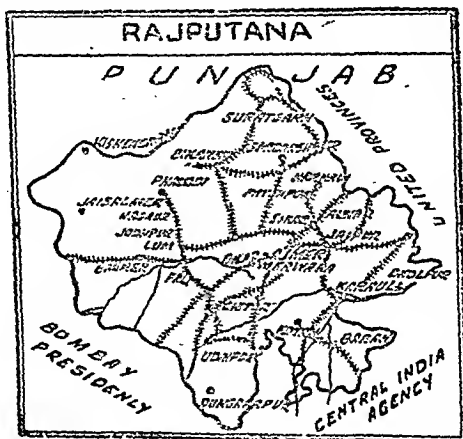


Fig. 78.

The Arawali hills intersect the country from one end to the other (from south-west to the north-east). The area is sandy ill-watered and unproductive but things improve as one goes to the South-West with great supplies of rain and irrigation works. In the south part lies an area of higher rainfall and fertile lands traversed by many rivers. The temperature conditions are of the same type. But the diurnal and seasonal ranges of temperature are very high. In the Rajput uplands conditions are bit better and some areas are also better and inhabited by Bhils and other tribes. Millets and other hardy crops are the chief crops of the regions, wheat and barley and even cotton occupy some area. Some facilities for irrigation exist.

In the matter of power resources and minerals the region is very poor indeed. And naturally the state of industrial development is equally low. Some cottage industries specially carpet making are followed specially in Baikaner. Wooden toys are made at Jodhpur, and marble and stone goods are well known at Jaipur and some other places. Blankets are also made at many places.

In the matter of communication Rajputana is still quite backward. The eastern half is the most developed in this respect. The mileage of metalled roads and broad-gauge is small. The total length of railways is 3,259 miles, out of which some 2,000 miles belong to the native states, specially Jodhpur, Baikaner, and Marwar.

The important cities are mostly the capitals of states of the same name. In Mount Abu, a small hill station lives the resident for Rajputana.

5. The Central India Agency and Gwalior:— The Central India Agency and Gwalior are now separate—since 1921—the former under the Resident for Central India stationed at Indore and the latter having its own resident. The Agency comprises of the following treaty states and 61 other minor states.

Name.	Area in square miles.	Population in 1941
Indore ...	9,902	15,13,966
Bhopal ...	6,924	9,95,745
Rewa ...	13,000	18,20,445
Orchha ...	2,080	3,63,405
Datia ...	912	1,74,072
Dhar ...	1,800	2,53,210
Dewas, Senior Branch	449	89,479
Dewas, Junior Branch	419	83,669
Samthar ...	178	38,279
Jaora ...	602	1,16,953

The agency is an irregularly formed area divided into, (a) the Western half comprising of Bhopal and Malwa Agencies and (b) the Eastern or Bundelkhand agency, by a portion of U.P. (consisting of Jhansi district), Sangor and Gwalior state of which the Malwa Division is a part of this region.

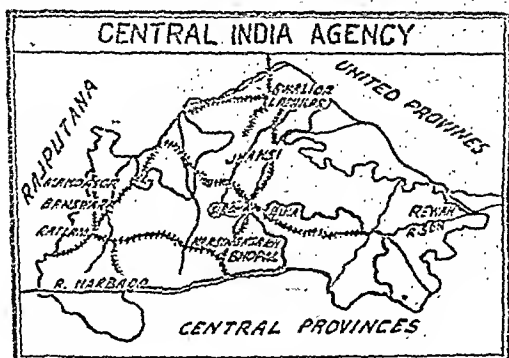


Fig. 79.

The western half is a part of the Malwa plateau and is composed of old, hard crystalline rocks. At places we also come across traces of lava. The climate is on the whole pleasant. Rainfall is about 40", lower in some places. It gets lower in north-west and the area gradually merges into the Thar Desert. Owing to the rough topography, irrigation is difficult. Dry, hardy crop like millet predominate. Some wheat and cotton are also grown in irrigated tracts. Indor, the capital of the Indore State, is the chief town and is famous for its cloth mills. Bhopal is also important and is gradually growing. Ujjain, the chief town of the Malwa division of the Gwalior State is also famous for its cotton mills.

The eastern half or the Bundelkhand agency is a part of the natural region called the Central India Forland. The area is a part of an irregular plateau and receives higher rainfall, about 45" and above. Rice is the chief crop, canal irrigation on a small scale is carried on. Industrially the area is very unimportant.

Gwalior which was upto 1921 a part of the C. I. agency is situated in the west of United Province and south of Delhi. It has an area of 26,367 square miles and a population of 3,992,000. Politically as well as geographically, it has two sub-divisions (1) Northern half which is partly a part of Bundelkhand and partly of the Gangetic plain and (2) Malwa which is a part of the Rajput Uplands and has already been described. The states boasts of many industries including cotton, leather, pottery and carpets. It has its own light railway. Gwalior, the capital is a good air centre with Manho Sagar as the sea-plane base and an aerodrome at Maharajpur.

NEPAL*

Politically the independent state (rather kingdom) of Nepal lies out of Indian frontiers but physically it is very much a part of the continent and the natural borders are not marked enough. Situated in the Himalayas Nepal measures 500 hundred miles from east to west and about 150 miles from north to south (its area being 54,000 square miles). This sovereign state (under a Hindu ruler) supplies the brave Gurkhas to the Indian army and serves as "the main Indian outpost against Tibetan aggression or against Chinese aggression through Tibet.

Physically Nepal is a very much mountainous—the Valley of the Nepal is enclosed between four passes in the Himalyas—The Phar Ping in south of the Pati in the north, the Saga in th east to the Panch Mane in the west. The area forms a part of the Ganges Basin and all the rivers drain to the Ganges basin—the chief being the Kasi, the Sapta Gandakis of the Karnab The valley is the best area in the state and is very thickly populated. Katmandu; the capital, is also situated in the Valley.

Forest areas on the hill sides and in the Terai are being increasingly reclaimed for agriculture. Rice, wheat, and maize are the main cereal crops. Timber, gums, resins and dyes are had from the forests. Communication is in a low state. The first railway into Nepal was built in 1927—it runs from Raxaul on the B. N. W. to Amlekganj whence a fairly good motor road runs to Bhim-Pendi A ropeway goes from Dhursing into the Katmandu Valley and is used for the movement of goods. Mineral resources await exploitation.

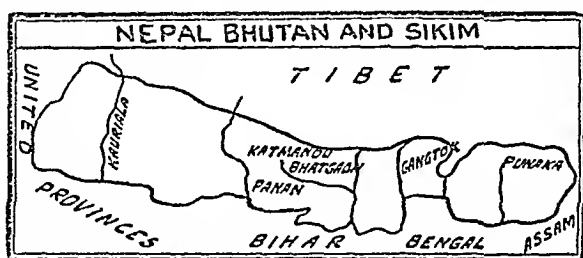


Fig. 80.

*Burma and Ceylon are also usually described along with India, but here they have been excluded as we feel that they possess their own identity as independent parts of Asia and thus lie out of our present scope.

SIKKIM*

Sikkim is a very small state about 100 miles long and 50 miles wide. The whole area is drained by the Teesta and its tributaries. In this small state, there are packed some of the highest mountains in the world. Sikkim shows the greatest confusion of high peaks and deep-cut valleys. Although the country is only a day's journey from Calcutta, some parts of it are inaccessible and some sections are still inaccurately mapped. From 1925 onwards there have been a number of expeditions in Sikkim, most of them in the Zemu valley. The valleys of Sikkim and the trade routes are well-known.

Sikkim is unique in its climate. It has the largest variety of climates in the smallest space. As Sikkim is outside the reach of the N. E. monsoons, it gets only the S. W. The monsoon sweeps into the valley of the Teesta and the lower foothills are extremely wet. As one gets further north up the Teesta valley, one gets into country similar to the dry Thibetan plateau. The range of altitudes in the country is also extreme, from 2,000 ft. to 28,000 (tropical heat to arctic conditions.) So the combination of wet and dry and hot and cold make it possible to find almost any climate, somewhere in Sikkim. In the deep valleys which are 2,000 to 3,000 feet the rainfall is as much as 200" a year; in the northern parts it is probably not more than 20" and just over the passes in Thibet, it is still less. In the low valleys there is very wet heat; Sikkim is of course well outside the tropics, but as it is also well inside the great land mass of Asia, in the low parts the weather is very hot. At the other extreme are found arctic conditions above an elevation of about 17,000 ft. Large areas of the state are under snow. These glaciers are very large in extent. Though they are not so big as those in the Karakorams which are the largest in the world, they are still very extensive, the best known perhaps being the famous Zemu glacier on the slopes of Kinchenjunga.

Political relations with Tibet are very close, in fact closer than with India. The Raja is of Thibetan family and there is close contact between him and the Lhasa. The Raja rules with the help of a British Resident, but he is almost entirely responsible for the internal affairs of the state. The Government of such a small place with only 60,000 inhabitants has rather a 'comic opera flavour.'

The people of Sikkim are very mixed. There are a number of aboriginals called Lepchas. They are forest people, able only to find a poor living. But a more vigorous people have come in from neighbouring Nepal, usually known to us as Gurkhas. These people, easily distinguishable by their short stature and broad Mongoloid faces, have driven the aborigines from the lower valleys.

*We have freely drawn from 'Sikkim' Indian Geographical Journal—January-March 1944.

into the northern and more inaccessible places. They have cleared stretches of forest. By means of terracing with great labour, the Nepalis grow their rice in tiny patches of ground irrigated by hill streams, and plant barley and wheat in the high valleys. The Nepalis live in a bracing climate and are active and cheerful. Besides, the Nepails there are also Bengalis from the plains and many Thibetans. In fact, the majority of those one sees on the tracks in the north, are Thibetans trading from place to place.

Sikkim is mountainous and one could hardly look for much in the way of economic development. The country has not been exhaustively surveyed geologically but so far as is known no minerals of any importance have yet been developed. So the small population depend on agriculture and transport traffic. It might be possible to extend the agriculture to grow tea, rubber, cinchona or cardamoms. Tea gardens which cover the Darjeeling district stop abruptly at the dividing line between British India and Sikkim. However, there really isn't a lot of scope for such crops and actually the people in the lower valleys cultivate only rice and maize and in the higher valleys wheat and barley. Recently the growing of potatoes and apples has become important in the very high valleys where so far the rearing of sheep and yaks was the only industry. The latter are of great use as beasts of burden, source of milk for food and of hair which is woven into clothing, ropes and tents. Indeed the yak, is of first rate economic importance in the high Himalayas. Clothing is chiefly made from wool of the mountain sheep. Where the cold is intense, people wear the whole sheepskins.

Besides agriculture, the only other industry of Sikkim is transport. There are several routes into Thibet but they are all difficult. Through Sikkim lies one of the easier routes into Thibet and the former country is the main channel through which this trade goes on. Even here, there are only mule tracks and the passes are from 14,000 ft. to 16,000 ft. There is only one cart road in the state about 30 miles long from British India to the capital, Gangtok; all the rest are mule or footpaths. Some attempt is now being made to improve the road to Gangtok and thence to Lhasa, the capital of Thibet. It is hoped, to provide a route via Gangtok, and Lhasa to China. It seems rather a far fetched idea, since all transport after Gangtok would be by mule but those in authority evidently think it practicable. The population of Sikkim in 1941 was 121,000.

BUTAN.

To the east of Sikkim is Bhutan which is identical to the former in its physical, cultural and political aspects. It receives a subsidy of one lakh from the Indian Government and the same guides its foreign policy. Bhutan has an area of about 15,000 sq. miles. Punaka is the capital of the state. Rice, maize, millets and silk are the chief products. Forests yield good timber besides many other products like gum and resins. Musk, elephants and ponies are also important. The people are Mongolian, nominally Buddhists.

THE END